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First Five-Year Review Report

for

Motor Wheel Disposal Site

Lansing, Ingham County, Michigan

CERCLIS ID# MID980702989; Site SPILL # 05S5

July 2002

Prepared By:

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Approved by:

William E. Muno
Director, Superfund Division

Date:

July 22, 2002

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List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
BWL	City of Lansing, Michigan Board of Water and Light
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
DEQ or MDEQ	Michigan Department of Environmental Quality
EPA/U.S. EPA	United States Environmental Protection Agency, Region 5 or Agency
ESD	Explanation of Significant Difference
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDNR	Michigan Department of Natural Resources (precursor agency to MDEQ)
MW	Monitoring Well
MWDS	Motor Wheel Disposal Site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PCOR	Preliminary Close-Out Report
PSD	Performing Settling Defendant
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SDWA	Safe Drinking Water Act
VOC	Volatile Organic Compound

Executive Summary

The Motor Wheel Disposal Site (MWDS or Site) is a 24-acre Site located on the northeast edge of the City of Lansing within the NE ¼, SW ¼, Section 3 of Lansing Township (T.4N., R.2W.), Ingham County, Michigan. The Site is bordered by: (1) abandoned Michigan Central Railroad tracks to the west and north; (2) the former W.R. Grace & Co. plant property (Michigan Fertilizer Company) to the south; (3) the City of Lansing/ Lansing Township boundary to the east; (4) the Granger/North Lansing Sanitary Landfill to the northeast; (5) the Paulson Street Landfill to the north (the Francis property is just south of this landfill); (6) the Daggett Landfill to the north of the Paulson Street Landfill; (7) the Friedland Iron and Metal Company due west; and (8) the North Lansing Fill No. 2 Board of Water & Light (BWL) to the southwest. There is also an abandoned gravel pit owned by MSV on the north side of the MWDS landfill.

The Site was used by the Motor Wheel Corporation for disposal of industrial wastes. The Site includes the following components: Site soils contaminated with ammonia, fluoride, and volatile organic compounds (VOCs); perched aquifer; glacial aquifer; and Saginaw sandstone aquifer. No use of perched zone or glacial aquifer groundwater has been identified in the vicinity of the Site. However, the Saginaw aquifer is utilized by the Lansing BWL as a drinking water supply.

The remedy for the Site included: (1) Construction of a groundwater treatment facility and monitoring center; (2) Installation of 16,000 feet of underground piping and nine extraction wells in the shallow and deeper aquifers; (3) ~20,000 cubic yards (yds^3) of clean soil covering MWDS former waste disposal area; (4) ~11.3-acre, three-foot thick clay cap installed over disposal area; (5) ~50,000 yds^3 of clean soil covering cap; (6) Cap revegetated with grass seed; and (7) Chain link security fence installed around perimeter of property.

The Site achieved construction completion with the signing of the Preliminary Close Out Report (PCOR) on December 18, 1997. The trigger for this five-year review was the actual start of construction on June 27, 1997.

The assessment of this five-year review found that the remedy was constructed in accordance with the requirements 1991 Record of Decision (ROD). On July 12, 2001, an Explanation of Significant Difference (ESD) was signed which incorporated the bedrock (Saginaw) aquifer into the overall groundwater cleanup. Immediate threats associated with the waste disposal area have been addressed. However, the groundwater remedy is not achieving capture of the groundwater contaminant plume. The U.S. EPA and MDEQ are working with the Goodyear Tire & Rubber Company and its consultant (Sharp & Associates, Inc.) to evaluate and implement upgrades to the extraction, treatment and monitoring systems. These modifications will ensure (1) that the remedy is protective in the long-term, (2) capture, treatment and removal of the threat posed by the entire MWDS contaminant plume within the glacial and Saginaw aquifers, and (3) that the Lansing BWL John Dye Water Conditioning Plant (WCP) production wells are protected from any adverse effects of the MWDS Saginaw aquifer ammonia contamination plume.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: Motor Wheel, Inc.

EPA ID *(from WasteLAN)*: CERCLIS ID# MID980702989; Site SPILL # 05S5

Region: 5	**State:** MI	**City/County:** Lansing, Ingham County

Site STATUS

NPL status: X☐ Final ☐ Deleted ☐ Other (specify)_____

Remediation status (choose all that apply): ☐ Under Construction X☐ Operating ☐ Complete

Multiple OUs?* ☐ YES X☐ NO	**Construction completion date:** 12 /18 /1997

Has Site been put into reuse? ☐ YES X☐ NO

REVIEW STATUS

Lead agency: X☐ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: John J. O'Grady

Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA Region 5

Review period:** 05/01/2002 to 07/10/2002

Date(s) of Site inspection: 06 /18-19/2002

Type of review:

X☐ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only
☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead
☐ Regional Discretion

Review number: X☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ☐ Other (specify) _____

Triggering action:

☐ Actual RA OnSite Construction at OU #____ ☐ Actual RA Start at OU#____
X☐ Construction Completion ☐ Previous Five-Year Review Report
☐ Other (specify) _____

Triggering action date *(from WasteLAN)*: 06 /27/1997

Due date *(five years after triggering action date)*: 06 /26/2002

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form (Continued)

Issues:

- Need to confirm through existing data sources and new monitoring wells, the nature, rate and extent of the MWDS contamination plume within the Saginaw aquifer;
- Need to design system upgrades consistent and compatible with the on-going Superfund remedial action to capture, treat and/or remove the threat posed by the entire MWDS contaminant plume within the glacial and Saginaw aquifers;
- Need to implement and integrate the U.S. EPA approved system upgrades (new Saginaw aquifer extraction wells, SEW-3 & SEW-4) into the on-going remedial action; and,
- Need to ensure that the BWL John Dye WCP production wells are protected from any adverse effects of the MWDS Saginaw aquifer ammonia contamination plume.

Recommendations and Follow-up Actions:

- Implement the Amended Scope of Work to the Amended Consent Decree.
- Continue with the approved Operation & Maintenance (O&M) Plan.

Protectiveness Statement:

All immediate threats associated with the waste disposal area have been addressed. However, the groundwater remedy is not achieving capture of the groundwater contaminant plume. The U.S. EPA and MDEQ are working with the Goodyear Tire & Rubber Company and its consultant (Sharp & Associates, Inc.) to evaluate and implement upgrades to the extraction, treatment and monitoring systems.

Long-term Protectiveness:

- Long-term protectiveness of the remedial action will be verified by obtaining additional groundwater samples to fully evaluate potential migration of the contaminant plume downgradient from the treatment area.
- Need to: (1) confirm through existing data sources and new monitoring wells, the nature, rate and extent of the MWDS contamination plume within the Saginaw aquifer; (2) design system upgrades consistent and compatible with the on-going Superfund remedial action to capture, treat and/or remove the threat posed by the entire MWDS contaminant plume within the glacial and Saginaw aquifers; (3) implement and integrate the U.S. EPA approved system upgrades (SEW-3 & SEW-4) to the on-going remedial action; and (4) ensure that the BWL WCP production wells are protected from any adverse effects of the MWDS Saginaw aquifer ammonia contamination plume.

Other Comments:

None.

I. INTRODUCTION

A. The Purpose of the Review

The purpose of five-year reviews is to determine whether the remedy at a Site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

B. Authority for Conducting the Five-Year Review

The Agency prepared this five-year review pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) §121 and the NCP. CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the Site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such Site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP. 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the Site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

C. Who Conducted the Five-Year Review

The U.S. EPA Region 5 has conducted this five-year review of the remedial actions implemented at the Site. The review was conducted from May 1, 2002, through July 10, 2002. This report documents the results of the review.

D. Other Review Characteristics

This is the first five-year review for this Site. The triggering action for this review was the date of the start of the Remedial Action, as shown in the U.S. EPA's WasteLAN database: June 27, 1997. This review is required since hazardous substances, pollutants, or contaminants have been left on Site above levels that allow for unlimited use and unrestricted exposure.

II. Site CHRONOLOGY

Table 1: Chronology of Site Events

Event	Date
Property used by Motor Wheel for disposal of industrial wastes	• 1938 to 1978
Motor Wheel Corporation was wholly owned subsidiary of Goodyear Tire and Rubber Co	• 1964 to 1986
Three cleanup actions initiated resulting in excavation and off-Site disposal of waste materials including solid wastes, paint sludges, and oils	• 1970 to 1972
Degraded soils exposed while stripping overburden from sand and gravel deposits. Exposed materials excavated, stockpiled, and covered with clay	• 1978
Proposed National Priorities Listing (NPL)	• October 15, 1984
Final NPL Listing	• June 10, 1986
Operations at Site were discontinued	• 1987
Motor Wheel, W.R. Grace, and Goodyear Tire and Rubber signed an Administrative Order by Consent to conduct Remedial Investigation/Feasibility Study (RI/FS)	• August 7, 1987
RI/FS Initiated	• August 7, 1987
RI/FS Completed	• September 30, 1991
Removal Assessments	• February 7, 1990 • March 3, 1991 • February 11, 1993
ROD Signature	• September 30, 1991
ESD	• July 12, 2001
Enforcement documents	• August 7, 1987 (AOC for RI/FS) • April 22, 1994 (CD for RD/RA)
Remedial Design (RD) Start	• May 16, 1992

Table 1: Chronology of Site Events

Event	Date
Administrative Order by Consent (AOC) effective for RD of remedy	• May 26, 1992
Consent Decree (CD) for RD/Remedial Action (RA) signed by U.S. EPA and responsible parties	• December 22, 1993
Signed Consent Decree referred to U.S. DOJ for lodging	• January 11, 1994
Consent Decree lodged in Court by U.S. DOJ	• February 16, 1994
Consent Decree entered by Court implementing 1991 ROD; including agreement to clean perched zone and glacial aquifer	• April 22, 1994
RD Complete	• June 26, 1997
RA Start	• June 27, 1997
Construction Start Date	• June 27, 1997
Construction Completion Date	• December 18, 1997
Preliminary Close-out Report (PCOR)	• December 18, 1997
Treatment system operational; pumping and treating glacial aquifer	• November 1997
Investigation of the Saginaw aquifer at the Motor Wheel Disposal Site	• Submitted March 13, 1998 (*The Saginaw aquifer investigation began in the fall of 1995 and is on-going.*)
U.S. EPA Region 5 Safe Drinking Water Act (SDWA) program issued 1st 1431 Order to W.R. Grace	• February 26, 1999
U.S. EPA Region 5 SDWA program issued 2nd 1431 Order.	• July 29, 1999
W.R. Grace filed 1st petition for review of SDWA 1431 Order with U.S. Court of Appeals, 3rd Circuit	• September 1, 1999

Table 1: Chronology of Site Events

Event	Date
W.R. Grace filed 2nd petition for review of SDWA 1431 Order with U.S. Court of Appeals, 3rd Circuit	• March 29, 2000
Final Risk Assessment Submittal, Saginaw aquifer, Motor Wheel Disposal Site, Lansing, Michigan	• June 22, 2000
Partial NPL Deletion (3.45 acres only)	• August 21, 2000
Buy-out agreement between Goodyear and W.R. Grace made Goodyear principal RP	• September 2000
W.R. Grace Appeals were consolidated and argued in U.S. Court of Appeals, 3rd Circuit	• September 27, 2000
U.S. Court of Appeals, 3rd Circuit (Case Nos.: 99-5662 & 00-3302; W.R. Grace & Co., Petitioner v. U.S. EPA, Respondent), vacated and remanded the U.S. EPA's 07/29/1999, 2nd SDWA 1431 Order.	• August 10, 2001
Containment well (SEW-3) located between the plume and BWL production wells installed. First of two new wells to work in concert with two existing wells (SEW-1 & 2).	• November 2001
Final Close-out Report (projected)	• September 30, 2027
Deletion from NPL (projected)	• December 31, 2027
Previous Five-year Reviews	• None

III. BACKGROUND

A. Physical Characteristics

The Motor Wheel Disposal Site (MWDS or Site) is a 24-acre Site located on the northeast edge of the City of Lansing within the NE ¼, SW ¼, Section 3 of Lansing Township (T.4N., R.2W.), Ingham County, Michigan. The Site is bordered by: (1) abandoned Michigan Central Railroad tracks to the west and north; (2) the former W.R. Grace & Co. plant property (Michigan Fertilizer

Company) to the south; (3) the City of Lansing/ Lansing Township boundary to the east; (4) the Granger/North Lansing Sanitary Landfill to the northeast; (5) the Paulson Street Landfill to the north (the Francis property is just south of this landfill); (6) the Daggett Landfill to the north of the Paulson Street Landfill; (7) the Friedland Iron and Metal Company due west; and (8) the North Lansing Fill No. 2 Board of Water & Light (BWL) to the southwest. There is also an abandoned gravel pit owned by MSV on the north side of the MWDS landfill.

B. Land and Resource Use

The current land use for the surrounding area is residential and commercial. Although there have been a number of zoning changes over the years, it is anticipated that a mix of land uses similar to that described will continue into the future. In establishing cleanup requirements for the Site, the U.S. EPA did not consider the theoretical possibility of residential development at the Site. The Site itself is currently fenced and the contaminated soils and are contained within the fenced area under an impermeable cap.

C. History of Contamination

The property was used by the Motor Wheel Corporation as a disposal Site for industrial wastes from 1938 until approximately 1978. The types of disposed wastes included; solid and liquid industrial wastes, including paints, solvents, liquid acids and caustics, sludges and other wastes. Wastes were disposed on the property in tanks, barrels, seepage ponds and open fill operations. MSV Associates, the former property owner, purchased the property in 1978 and operated a sand and gravel mine in the northeast portion of the property until 1987. An estimated 210,000 cubic yards of waste material is in place at the Site. Materials identified in the waste matrix are soils, railroad ties, tires, vesicular and glassy slag, demolition debris, asphalt, plastic, and glass fragments. Along with the solid wastes, liquid wastes are known to have been disposed on the Site. The upper portions of the waste disposal area are unsaturated.

The groundwater present in the lower portions of the waste material and on top of the perched layer is believed to be the result of infiltration from precipitation occurring in the immediate area of the Site. Saturated waste material and soils at depths greater than 4 feet contain significant levels of 1,2-dichloroethane, trichloroethene, toluene, ethyl benzene, and xylenes. Pesticides and PCBs are present sporadically across the Site. Semi-volatile compounds are present in soils in the waste disposal area at depths generally greater than 10 feet and sporadically in the interval shallower than 10 feet. 1,2-dichloroethene and bis(2-ethylhexyl) phthalate were commonly detected in concentrations ranging from 26 ppb to 330 ppb and from 11.1 ppb to 19.5 ppb, respectively. Secondary water quality standards for nitrate, chloride, fluoride, and sulfate were exceeded in several samples from the perched zone and glacial aquifer wells. Detections of trichloroethene, vinyl chloride, 1,2-dichloroethene, and benzene are centered in the south central part of the Site.

Hydrogeology at the Site includes a perched aquifer, and glacial aquifer, and the Saginaw (bedrock) sandstone aquifer. The Saginaw Formation underlying the perched and glacial aquifers, is the sole source of water for the City of Lansing. The groundwater plume in the Saginaw aquifer is considered to be part of the glacial aquifer plume since a continuous confining layer is not present at the Site, resulting in vertical communication between these aquifers.

Following the implementation of the ROD, investigation of the risks posed by the Site to the Saginaw aquifer were continued as part of the overall remedial response activities and further advanced in accordance with *Saginaw Formation Aquifer Investigation Work Plan Addendum, No. 1.* Results of these investigations are reported in *The Investigation of the Saginaw Aquifer at the Motor Wheel Disposal Site*, dated March 13, 1998.

The investigation revealed groundwater contamination from the MWDS in the Saginaw aquifer. The study indicated that contaminants, specifically ammonia and vinyl chloride, had migrated downward through leakage areas to the south and west of the MWDS. The levels of ammonia and vinyl chloride contamination within the Saginaw aquifer are at concentrations above the clean-up standards set forth in the 1991 ROD. The south-flowing, high velocity glacial aquifer waters enter and mix with northwesterly flowing, low velocity Saginaw aquifer waters. There are also westerly, southwesterly, and southerly flow components to the Saginaw aquifer. It must also be noted that groundwater flow within the Saginaw aquifer is heavily influenced by the BWL production wells.

D. Initial Response

Between 1970 and 1982, at least three cleanup actions were initiated that resulted in the excavation and off-Site disposal of waste materials. In 1970, the Michigan Department of Natural Resources (MDNR) requested that the Motor Wheel Corporation remove all solid wastes, paint sludges, and oils from seepage pond areas for disposal off-Site. Some of the excavated materials were disposed off-Site and the former pond areas were backfilled.

In 1978, following the acquisition of the Motor Wheel property by MSV Associates, while stripping overburden from the on-Site sand and gravel deposits, industrial waste and degraded soils were exposed. The exposed materials were excavated and stockpiled on the western part of the Site, then covered with clay. In December of 1982, there was a removal of three 10,000-gallon tanks and their contents, and degraded fill material from several locations on the Site. The three tanks, approximately 800 cubic yards of contaminated soil/fill surrounding them, and approximately 350 cubic yards of fill material containing an unknown number of drums were disposed off-Site. All operations at the Site were discontinued in 1987.

E. Basis for Taking Action

The baseline risk assessment for the Site evaluated the risk from different areas or units independently. The following units were evaluated: (1) surface soil and potentially eroded waste

mass material; (2) surface water sediments; (3) surface water; (4) perched zone groundwater; (5) glacial aquifer groundwater; and (6) glacial aquifer phthalates. Since capping of the Site would reduce the fugitive dust pathway, it was not evaluated as part of the risk assessment.

Glacial Aquifer Groundwater: The excess lifetime cancer risk (ELCR) from dermal contact with and ingestion of glacial aquifer groundwater is 5.47×10^{-3}. The summed Hazard Indices (HIs) for the same exposure routes for adults and children are 9.60×10^{-1} and 1.56×10^{0}, respectively. The majority of the risk associated with the glacial aquifer is due to ingestion. Vinyl chloride makes up 98.7% of the risk.

Perched Zone Groundwater: The ELCR from dermal contact with and ingestion of water from the perched zone is 7.16×10^{-4}. The summed HIs for the same exposure routes for adults and children are 3.85×10^{-1} and 6.28×10^{-1}, respectively. The majority of the risk from the perched zone groundwater is via ingestion. Vinyl chloride makes up the majority of the risk, 92%, or a risk of 6.61×10^{-4}.

Sediments and Surface Water: The ELCR from contact with sediment via dermal contact and ingestion at the pond was 1.50×10^{-8}. The summed HIs for adults and children was 1.92×10^{-5} and 6.07×10^{-4}, respectively. The ELCR from surface water by dermal contact and ingestion was 6.59×10^{-11}. Summed HIs were 4.79×10^{-7} for an adult and 9.1×10^{-7} for a child.

Soil: The sum of the dermal contact and ingestion pathways ELCR was 1.46×10^{-6} for soil. The HI risks for adults and children are 1.44×10^{-3} and 6.91×10^{-3}, respectively.

Ecological Impacts: The Site offers only minimal habitat for wildlife, and is considered a "small animal habitat." Studies conducted during the RI/FS did not indicate the presence of endangered species in the vicinity of the Site. The acute and chronic ambient water quality criteria (AWQC) for the protection of aquatic life for bis(2-ethylhexyl) phthalate are 11ug/liter and 3ug/liter respectively. No environmental risk is assigned for the surface water.

Hazardous substances that have been released at the Site in each media include:

Glacial Aquifer Groundwater	Perched Zone Groundwater	Sediments and Surface Water	Soil
1,1-dichloroethene bromoethane chloroform 1,2-dichloroethene benzene 2-hexanone tetrachloroethene nitrate chloroethene 1,2-dichloroethane bis(2-ethylhexyl) phthalate vinyl chloride 1,1-dichloroethene trichloroethene methylene chloride sulfate	1,2-dichloroethene 1,2-dichloroethane benzene tetrachloroethene trichloroethene 2,4,6-trichlorophenol 1,1-dichloroethene 4-methyl-2-pentanone ethylbenzene toluene methylene chloride di-n-octylphthalate fluoranthene pyrene vinyl chloride bis(2-ethylhexyl) phthalate 2-butanone chloromethane naphthalene 2-methyl naphthalene xylenes nitrate sulfate	1,2-dichloroethene benzene bis (2-ethylhexyl) phthalate chloride fluoride nitrate sulfate trichloroethene vinyl chloride	arsenic bis(2-ethylhexyl) phthalate 1,2-Dichloroethane 4,4-DDT dieldrin ethyl benzene heptachlor PAHs toluene trichloroethylene xylene zinc

IV. REMEDIAL ACTIONS

A. Remedy Selection

Remedial Investigation/Feasibility Study (RI/FS): On August 7, 1987, an Administrative Order by Consent for an RI/FS was signed.

Record of Decision: The September 30, 1991, ROD selected a remedy that included collection of groundwater from the perched zone and the glacial aquifer and treatment of that contaminated groundwater. The groundwater collection system was supposed to maintain hydraulic control in the three designated zones of the glacial aquifer to aquifer to enhance the dewatering of the

perched zone aquifer and prevent spread of the contaminant plume. The following components were prescribed by the 1991 ROD and have been installed with approved designs:

- Installation of an ~11.3 acre Michigan Act 64 cap over the disposal area;
- Back-filling to cover exposed fill areas and to establish an acceptable slope in the excavated area of the Site for extension of the cap;
- Extraction of contaminated groundwater from the perched zone and the glacial aquifer and treatment of the groundwater by air stripping;
- Site deed restrictions, and;
- Groundwater monitoring to assess the state of the remediation.

The ROD addressed remedies for the waste mass and the groundwater contamination in the perched zone and the glacial aquifer at the Site. The waste mass represents a source for contamination of groundwater in the perched zone and the glacial aquifer. The contaminated groundwater represents a primary threat to human health and the environment due to ingestion and contact with contaminated water from the perched zone and the glacial aquifer. For the contaminants vinyl chloride and fluoride, concentrations are above the maximum contaminant levels (MCLs) established by the SDWA and/or Michigan Act 307 Type B standards and are a source of contamination to the Saginaw aquifer. Ammonia concentrations are above the levels based on odor and taste considerations established in the 1991 ROD.

Explanation of Significant Differences: On July 12, 2001, an ESD was signed that addressed: (1) the extension of the operable unit as defined in the 1991 ROD to include the Saginaw aquifer; and (2) the modification of the groundwater standards for vinyl chloride and flouride to the MCL.

B. Remedy Implementation

Remedial Design/Remedial Action (RD/RA):

- RD started on May 16, 1992.
- On May 26, 1992, an AOC became effective for RD of the remedy.
- A CD for RD/RA was signed by U.S. EPA and responsible parties on December 22, 1993.
  - The signed CD was referred to U.S. DOJ for lodging January 11, 1994, and lodged in Federal Court on February 16, 1994.
  - The Judge entered the CD implementing the 1991 ROD and including agreement to clean perched zone and glacial aquifer on April 22, 1994.
- The RD was completed on June 26, 1997.
- The RA started on June 27, 1997. Construction of the remedy was completed on December 18, 1997, as documented by the PCOR of the same date.

Groundwater: Contaminants in the Saginaw aquifer groundwater represent a primary threat to human health and the environment through ingestion and dermal contact pathways. These waters contain ammonia at concentrations above the 34 ppm clean-up standard that was set forth in the

1991 ROD, and further confirmed to be protective by the *Final Risk Assessment Submittal, Saginaw Aquifer, Motor Wheel Disposal Site, Lansing, Michigan.* dated June 22, 2000 (FRAS). The levels of vinyl chloride and ammonia within the Saginaw aquifer have been detected above the new State of Michigan clean-up standards set forth in Part 201 of the Natural Resources and Environmental Protection Act (MDEQ Part 201), PA 451 of 1994, as amended (2 ug/l for vinyl chloride; 2 mg/l for ammonia). Levels of fluoride within the Saginaw aquifer have been detected above the new cleanup standards set forth in MDEQ Part 201 (4 ug/l), most notably in MW-68. The groundwater remediation system will continue to extract and treat groundwater until the following cleanup standards are met:

Contaminant	Cleanup Standard
Ammonia	34.0 mg/L
Vinyl Chloride	2.0 µg/L
Fluoride	4.0 µg/L

Elevated levels of ammonia in the Saginaw aquifer could potentially interfere with the disinfection process utilized by the BWL, and pose a threat to the drinking water supply for the City of Lansing. In order to address this contamination, the U.S. EPA developed an amended statement of work (A-SOW) that expanded the on-going RA addressing the MWDS contamination plume within the perched zone and glacial aquifer, and MWDS contamination (principally ammonia and vinyl chloride) within the Saginaw aquifer. The overall purpose was to be protective of the current and future uses of groundwater from the Saginaw aquifer and to clean-up the MWDS Saginaw aquifer contaminant plume to the appropriate standards. In addition, there are Saginaw aquifer performance criteria that are meant to prevent disinfection and nitrification problems posed by excess ammonia-nitrogen entering the BWL production wells.

Remedial Objectives

- Provide hydraulic control of ammonia plume to 34 mg/L (CERCLA requirement).
- Provide protection of BWL wells with a goal to prevent an exceedance of 1.2 mg/L ammonia (SDWA objective).
- Design system incorporating existing RA and municipal systems infrastructure.
- Comply with NPDES permit.
- Locate additional well (SEW-3) to the Northwest so that BWL wells do not exceed 1.2 mg/L; SEW -3 will be a containment well.
- Locate acceleration well (SEW-4) near higher mass to allow SEW 1-3 to run year round w/o treatment; SEW-4 will be a mass removal well.

Please note that SEW-3 & SEW-4 are not expected to be operational until December 2002.

Scope of Amended SOW:

- To delineate, through existing data sources and new monitoring wells, the nature, rate and extent of the MWDS contamination plume within the Saginaw aquifer;

- To upgrade the on-going Superfund remedial action to capture, treat and/or remove the threat posed by the entire MWDS contaminant plume within the Saginaw aquifer;
- To implement the U.S. EPA approved remedial design upgrades integrating the Saginaw aquifer into the on-going remedial action; and,
- Ensure that the BWL John Dye WCP production wells are protected from any adverse effects of the MWDS Saginaw aquifer ammonia contamination plume.

Goals of Amended SOW:

- Prevent the further migration of the MWDS Saginaw aquifer contamination plume by means of a series of containment wells. Containment shall be achieved by means of hydraulic capture of the MWDS Saginaw aquifer plume by the installation of two more extraction wells (SEW-3 & SEW-4) to augment the two Saginaw extraction wells (SEW-1 and SEW-2) currently in use at the Site.
- Reduce the available mass of contamination within the MWDS Saginaw aquifer contamination plume by means of at least one extraction well (SEW-4) installed into an area of the MWDS Saginaw aquifer contamination plume.
- Ensure that the Lansing BWL John Dye WCP production wells are protected from the MWDS Saginaw aquifer contamination plume by establishing as a design goal protection of the Lansing BWL production wells, and implementing the containment and mass extraction well systems outlined above.

Implementation of Additional Remedial Actions: Based on the existing groundwater models developed by Waterloo Hydrogeologic and other data, it is believed by Goodyear and its consultant that the installation of the two additional Saginaw aquifer Extraction Wells (SEW-3 & SEW-4) will accomplish the remedial objectives of containment of the MWDS Saginaw aquifer contamination plume, reduction in contamination mass in the plume, and protection of the BWL production wells.

The U.S. EPA and MDEQ note that there is a portion of the plume that is migrating to the south, and that there is currently a difference of opinion on whether or not the installation and operation of SEW-3 & SEW-4 will maintain hydraulic control of the plume. Therefore, if it is determined from review of data generated under the long-term monitoring program or from other credible data sources by the U.S. EPA in consultation with the MDEQ, that the MWDS Saginaw aquifer contamination plume is continuing to migrate or otherwise affect BWL production wells, then additional remedial response actions will be required under CERCLA or SDWA authorities.

The groundwater remediation system will continue to extract and treat groundwater from the perched zone, glacial and Saginaw aquifers until the cleanup standards are met.

C. System Operations/Operation and Maintenance (O&M)

At present, monitoring of groundwater conditions in and around the Site are being conducted to monitor the effectiveness of the on-going remedial action and to allow for safe-guards to the

BWL John Dye WCP. In addition to these monitoring efforts, Goodyear shall develop a Long-Term Monitoring Plan for the purpose of monitoring the following:

- Effectiveness of hydraulic capture produced by the extraction wells;
- Effectiveness of the mass reduction well (calculation of quantity of mass removed);
- Potential impact of the MWDS Saginaw aquifer contamination plume on BWL production wells, which will be determined by three performance criteria, given below:
  - An ammonia-nitrogen concentration in excess of 1.2 mg/l in a BWL production well;
  - A statistically significant increase in the ammonia-nitrogen concentration in a BWL production well (as determined by an EPA approved statistical technique); and/or,
  - Modeling from an EPA approved groundwater model, predicting that, based upon existing information, an exceedance of 1.2 mg/l ammonia-nitrogen is likely to occur in a BWL production well.

The reporting of the results of long-term monitoring shall be incorporated into quarterly groundwater monitoring reports, or other agreed upon formats. The Long-Term Monitoring Plan shall include a sampling program to identify any unknown or suspected sources of contamination to ensure that Goodyear's response action does not extract and discharge unidentified contamination from the glacial or Saginaw aquifers not originating from or otherwise associated with the MWDS contamination plume. If and when any such unknown or suspected sources of contamination are identified by the long-term monitoring, then the U.S. EPA in consultation with MDEQ, would need to consider the most appropriate enforcement approach, including the possibility of working with Goodyear to fairly and equitably address the cleanup of that contamination. Generally speaking, U.S. EPA would not necessarily require a responsible party to cleanup unknown or suspected sources of contamination not originating from or otherwise attributable to its Site, nor would the U.S. EPA necessarily require that responsible party to pursue "third party" legal action under CERCLA to do so.

Table 2: MWDS Cost History (Costs Presented in $K)

YEAR	LANDFILL	GLACIAL	SAGINAW	TOTAL
1996	160	136	136	432
1997	3,610	2,260	1,470	7,340
1998	10	740	460	1,210
1999	10	640	650	1,300

Table 2: MWDS Cost History (Costs Presented in $K)

YEAR	LANDFILL	GLACIAL	SAGINAW	TOTAL
2000	10	385	913	1,308
2001	10	403	1,537	1,950
2002	25	330	1,680	2,035
1996 - 2002	**3,835**	**4,894**	**6,846**	**15,575**
2003		344	670	1,014
2004		344	670	1,014
2005		344	670	1,014
2006	15	344	670	1,029
2007		344	670	1,014
2008		344	670	1,014
2009		344	670	1,014
2010	15	344	670	1,029
2011		344	670	1,014
2012		344	670	1,014
2013		344	670	1,014
2014	15	344	670	1,029
2015		344	670	1,014
2016		344	670	1,014
1996 - 2016	**3,880**	**9,710**	**16,226**	**29,816**

V. Progress Since Last Five-Year Review

This Five Year Review and Report is the first for this Site.

VI. Five-Year Review Process

A. Administrative Components

The Goodyear Tire & Rubber Company and its consultant were notified of the initiation of the five-year review on May 14, 2002. The Motor Wheel Five-Year Review was led by John J. O'Grady, U.S. EPA Region 5, Remedial Project Manager (RPM) for the Site, and included Dave Novak, Community Involvement Coordinator (CIC) from the U.S. EPA Region 5 Office of Public Affairs. Messrs. Robert L. Franks and Charles Graff of the MDEQ Environmental Response Division, Superfund Section assisted in the review as representatives of the support agency. In addition, Mr. D.B. "Dave" Westjohn, Geologist/Geophysicist with the USGS Water Resources Division assisted the U.S. EPA Region 5 RPM on groundwater and geological issues.

On May 14, 2002, the schedule was established through signature on June 26, 2002, and included consideration of the following components:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection;
- Local Interviews; and
- Five-Year Review Report Development and Review.

The schedule was later extended through July 2002, to accommodate the review and incorporation of comments from MDEQ, into the final five-year review.

B. Community Involvement

It was decided by the RPM and CIC that based upon prior community involvement, a notice would be sent to a local newspaper that the five-year review was being initiated (Friday, May 31, 2002, Lansing State Journal). Then, based upon any responses received from the public, further public information activities would be targeted to address concerns raised, if any.

In August 2002, a notice will be sent to the same local newspapers announcing that the Five-Year Review report for the Site is complete, and that the results of the review and the report are available to the public at the local repository located at the Lansing Public Library, 401 S. Capitol Ave., Reference Section, 2nd Floor, Lansing, Michigan 48933, and the U.S. EPA Region 5 Office. This Five Year Review and Report is included in the Administrative Record and the Information Repositories for the Site.

C. Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data (See Attachments 2 & 3). Applicable groundwater cleanup standards, as listed in the 1991 Record of Decision, were reviewed.

D. Data Review

The initial response actions concentrated on contamination found at the Site of the former disposal area, and the contamination emanating from the landfill into the perched and glacial aquifers. Following the implementation of the response actions for these two groundwater aquifers, studies were initiated to determine the extent of contamination present in the Saginaw aquifer.

Quarterly Monitoring Reports
Chemical data was collected during the third and fourth week of January 2002. Groundwater levels were recorded from January 22-23, 2002. A total of 61 monitoring and extraction wells were sampled this quarter.

Please refer to Attachment 3 for information on the contaminant concentrations in groundwater.

E. Site Inspection

On Tuesday, June 18, 2002, and Wednesday, June 19, 2002, a five-year review inspection was conducted by John J. O'Grady, the U.S. EPA Region 5 RPM. The review and meetings were attended by the following participants:

Goodyear Tire & Rubber Company
- Todd Struttman, Sharp & Associates
- Jeff Sussman, Goodyear Tire & Rubber Company

Michigan Department of Environmental Quality

Drinking Water and Radiological Protection Division
- Timothy A. Benton, P.E.

Supervising District Engineer, Field Operations Section

Environmental Response Division, Superfund Section
- Robert L. "Rob" Franks, Project Manager
- Charles W. "Chuck" Graff, Geologist, Superfund Support Unit

Lansing Board of Water & Light
- Nicholas T. "Nick" Burwell, Manager

Environmental Services Resource Center

- Bill Maier, Water Quality Administrator
  Environmental Services Resource Center
- Greg A. Adsit, Manager
  Water Production
- Lynn L. Adsit, Manager
  BWL Laboratory

U.S. EPA Region 5

- John J. O'Grady, U.S. EPA Region 5 RPM

U.S. Geological Survey, Water Resources Division

- D.B. "Dave" Westjohn, Geologist/Geophysicist

Tuesday, June 18, 2002: On Tuesday, June 18, 2002, from 8:30 a.m. until about 10:00 a.m., a kick-off meeting was held at Public Affairs Associates in Lansing. This meeting laid the agenda for the next two days, including scheduling of Wednesday's issues meeting. Following the kick-off meeting, the landfill cap and Site fencing were inspected, followed by inspection of zones 1, 2, and 3, as well as the new extraction well (SEW-3). The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of fencing to restrict access and the integrity of the cap. No significant issues were identified regarding the cap, drainage structures, or fence.

Site Security: With the exception of one fence pole, the Site fencing was in good condition. Security appears adequate for the Site.

Landfill Surface: The landfill cover showed no signs of: (1) significant differential settlement; (2) cracks; (3) erosion; or (4) holes. The cover was well vegetated, with well-maintained rip-rap in drainage swales. There was no evidence of water damage, bulges, or slope instability.

Main Site Control Building: The pump house was inspected and found to be in good working order. The pump & treat control system is computerized; a demonstration of the program was given to the satisfaction of the RPM. It was noted, however, that during the tour of the groundwater treatment plant that extraction wells in Zones 2 and possibly 3 cycled on and off as noted on the computer screen. This had to do with running the system at a higher gpm than usual causing temporary failures. This was later adjusted by the plant operator (Lloyd Shannon, Sharp & Associates).

Landfill Gas: There is no landfill gas production associated with this landfill, and therefore, there is no passive or active gas collection system.

Monitoring Wells: The groundwater monitoring wells inspected were for the most part all flush mounted, due to their location in residential neighborhoods. All were found in good order.

Overall Observations: Overall observations by the RPM were that the facility, Site and data-logging system is well-maintained and under-control. Monitoring and reporting are adequate. Goodyear and its consultant will optimize the pump & treat system, including monitoring and reporting, once SEW-3 & SEW-4 are on-line and operational (not expected until December 2002). The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed.

Wednesday, June 19, 2002: On Wednesday, June 19, 2002, from 8:30 a.m. until about 11:30 a.m., a meeting was conducted at the Lansing BWL to go over MDEQ concerns. Issues discussed and resolved included: (1) Status and contents of the A-SOW; (2) Monitoring Well Completion Methodology; (3) Saginaw aquifer Cleanup; (4) Additional Saginaw aquifer Characterization; (5) Glacial Aquifer concerns; and (6) Monitoring Data Adequacy for Plume Verification. From 11:30 a..m. until approximately 12:15 p.m., a Site Inspection was conducted of a typical vault and aeration chamber. Finally, from 1:00 p.m. until about 3:00 p.m., walk-thru's of the BWL John Dye WCP on Cedar Street Filtration Plant and the BWL Central Laboratory were conducted.

Interviews/Public Meeting: Interviews were not conducted for this five year review with various parties connected to the Site. A public meeting was not held, nor was one requested by any member of the public.

VII. Technical Assessment

A. Question A: Is the remedy functioning as intended by the decision documents?

The review of documents, ARARs, risk assumptions, and the results of the Site inspection indicate that the remedy is not functioning as intended by the ROD, as modified by the ESD. The capping of the contaminated soils has achieved the remedial objectives of minimizing the migration of contaminants to groundwater and surface water, and prevention of direct contact with, or ingestion of, contaminants in soils. The cap and the surrounding area were undisturbed, and no new uses of groundwater were observed. The fence around the Site is intact and in good repair. Operation and maintenance of the cap and drainage structures has, on the whole, been effective.

However, current monitoring data indicate that the remedy is not functioning as required to achieve groundwater cleanup goals. Upgrades are needed to the groundwater remedies to bring them into compliance. Once implemented, the groundwater remedies are expected to be protective of human health and the environment upon attainment of groundwater cleanup goals, through pump & treat, which is expected to require up to 30 years to achieve.

O&M annual costs are consistent with original estimates. There were no opportunities for system optimization observed during this review. With the addition of eight new monitoring wells, the monitoring network should provide sufficient data to assess the progress of capture of

the contaminant plume. U.S. EPA in consultation with MDEQ, will continue to assess the Long-Term Monitoring Program to ensure adequacy. Maintenance on the cap is sufficient to maintain its integrity.

B. Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

There have been no changes in the physical conditions of the Site that have affected the exposure scenarios and risk identified in the ROD, as modified by the ESD, or altered the protectiveness of the remedy.

Changes in Standards and To Be Considereds (TBCs)

As the remedial work has been completed, the ARARs for soil contamination cited in the ROD have been met. There have been no changes in these ARARs and no new standards or TBCs affecting the protectiveness of this portion of the remedy.

Changes in Exposure Pathways, Toxicity, and Other Contaminant Characteristics

The exposure assumptions used to develop the FRAS included both current exposures and potential future exposures. There have been no changes in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment. These assumptions are considered to be conservative and reasonable in evaluating risk and developing risk-based cleanup levels. No change to these assumptions, or the cleanup levels developed from them is warranted. There has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

Please note, however, that the remedy is not progressing as expected based upon the lack of hydraulic capture of the contaminant plume. Goodyear and its consultant believe that with the significant upgrades to the groundwater remedy pursuant to the amended Consent Decree and amended SOW, the remedial objectives of containment of the MWDS Saginaw aquifer contamination plume, reduction in contamination mass in the plume, and protection of the BWL production wells will be met. The groundwater remediation system will continue to extract and treat groundwater from the perched zone, glacial and Saginaw aquifers until the cleanup standards are met.

The U.S. EPA and MDEQ note that there is a portion of the plume migrating to the south, and that there is a difference of opinion on whether or not the installation and operation of SEW-3 & SEW-4 will maintain hydraulic control of the plume. Therefore, if the U.S. EPA in consultation with the MDEQ, determines from review of data generated under the long-term monitoring program or from other credible data sources that the MWDS Saginaw aquifer contamination

plume is continuing to migrate or otherwise affect BWL production wells, then additional remedial response actions will be required under CERCLA or SDWA authorities.

C. Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No ecological targets were identified during the baseline risk assessment nor during the five-year review. Therefore, monitoring of ecological targets is not necessary. No weather-related events have affected the protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedy.

D. Technical Assessment Summary

According to the data reviewed and the Site inspection, the groundwater portion of the Site remedy is not functioning as intended by the ROD, as modified by the ESD. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. The ARARs cited in the ROD that required the elimination of infiltration through, and direct contact with, contaminated soils have been met. There has been no change in the toxicity factors for the contaminants of concern that were used in the baseline risk assessment, and there has been no change to the standardized risk assessment methodology that could affect the protectiveness of the remedy.

However, the groundwater portion of the remedy is not progressing as expected based upon the lack of hydraulic capture of the contaminant plume. There is a portion of the plume migrating to the south. There is also a difference of opinion on whether or not the significant upgrades to the groundwater remedy pursuant to the amended Consent Decree and amended SOW will maintain hydraulic control of the plume, reduce the contaminant mass in the plume, and protect the BWL production wells. The U.S. EPA in consultation with the MDEQ, will continue to review data generated under the long-term monitoring program or from other credible data sources and require additional remedial response actions under CERCLA or SDWA authorities if it is found that the MWDS Saginaw aquifer contamination plume is continuing to migrate or otherwise affect BWL production wells.

VIII. Issues

On Wednesday, June 19, 2002, from 8:30 a.m. until about 11:30 a.m., a number of the outstanding issues were addressed between Goodyear Tire & Rubber Company, the Lansing BWL, Michigan DEQ, U.S. EPA, and USGS. The meeting was conducted at the Lansing BWL. Issues discussed and resolved included: (1) status and contents of the A-SOW; (2) monitoring well completion methodology; (3) Saginaw aquifer cleanup; (4) additional Saginaw aquifer characterization; (5) glacial aquifer concerns; and (6) monitoring data adequacy for plume verification; (7) and (8) team communication.

(1) **Status of the A-SOW:** The amended scope of work (SOW) was discussed and MDEQ comments dated June 26, 2002, were addressed to the satisfaction of all parties.

(2)**Monitoring well completion methodology:** The monitoring well completion methodology was discussed and MDEQ comments dated May 16, 2002, were addressed. There are still a number of issues that MDEQ does not feel have been properly addressed. One major issue is that MDEQ still has concerns regarding the effectiveness of the packer system to deliver representative aquifer samples over the long-term. There will be an evaluation period of approximately one year after which some major decisions will be made with respect to the monitoring well completion methodology. At the August 14, 2002, modeling meeting, this will be discussed further, with the hope that a decision will be reached as to the appropriate length of this evaluation period and possible decision points based upon the results of the evaluation.

(3) **Saginaw aquifer cleanup:** The following were the major issues surfacing on the Saginaw aquifer cleanup.

- **60% design of discharge piping for SEW-3 & SEW-4:** Goodyear (Jeff Sussman, contact) will submit the 60% design of the discharge piping by the third week of August 2002. There will be a meeting with the City of Lansing to include Goodyear, Sharp & Associates. The BWL, MDEQ, and U.S. EPA will be invited to attend the meeting as very interested parties to a successfully completed design and approval.

- **SEW-3 & SEW-4 installation/operation:** Goodyear will meet with its consultant to refine its project completion chart, looking at critical path items, and refine to the maximum extent possible. The goal is to shorten the installation and operational target date for SEW-3 & 4 from December 2002, to something earlier. Jeff Sussman will submit the new target date to all parties (monthly report as a communication vehicle would be fine).

- **Northeast characterization:** Goodyear will take a look at issues of better characterizing the northeast sector of the plume and get back to the group (Jeff Sussman, contact). This can be a side-bar discussion at August 2002 modeling meeting.

(4) **Additional Saginaw aquifer characterization:** Monitoring data from the additional eight groundwater monitoring wells will be evaluated prior to any requirement for additional monitoring wells.

(5) **Glacial Aquifer Concerns:** This will continue to be looked at through on-going monitoring.

(6) **Monitoring Data Adequacy for Plume Verification:** The following were the major issues surfacing on monitoring data adequacy for plume verification.

- **Quarterly sampling:** The next round of sampling will take place the week of July 16, 2002. This date may be moved to August to accommodate the BWL (Jeff Sussman contact).

- **Well sampling accessibility:** The BWL will attempt to make wells 25-14, 25-18, 25-20 & 25-26 accessible for sampling by Goodyear prior to the scheduled quarterly sampling (Nick Burwell, contact). Goodyear indicated that it would be willing to postpone until August 2002, its sampling effort in order to ensure the sampling of these wells.

- **Sampling protocol:** Goodyear will review its sampling protocol with the field team prior to the July/August 2002 quarterly sampling to ensure that the low flow methodology is being properly followed (Jeff Sussman, contact).

- **Well venting:** A sidebar conversation to the August 2002 modeling meeting will be conducted by Goodyear, MDEQ, USGS, and U.S. EPA regarding the approach to venting the wells prior to sampling efforts (Jeff Sussman, contact). Venting in zone 3 groundwater monitoring wells is of particular concern due to security.

(7) **Team communication:** The following were the major issues surfacing on team communication.

- **Bi-weekly U.S. EPA/MDEQ conference calls:** John O'Grady will contact Chuck Graff/Rob Franks on a once every two weeks basis to go over the project status and any arising concerns or issues. Next call is scheduled for week of July 8th (due to planned vacation).

- **Quarterly team meetings:** The group (BWL, Goodyear, MDEQ, Sharp & Associates, USGS, U.S. EPA) will have quarterly meetings from this point on in Lansing, MI. The purpose of these meetings will be to go over project status, methodologies, issues, etc. No attorneys need be present. The next scheduled quarterly meeting will be on **Tuesday, September 10, 2002 at the MDEQ offices** (Rob Franks, contact).

- **Groundwater modeling meeting:** MDEQ (Chuck Graff) will host a meeting of the groundwater modelers for this Site (Waterloo, Sharp, Goodyear, MDEQ, BWL, U.S. EPA, USGS, and Dave Wilson's contractors) to go over comments and concerns on the modeling effort. This meeting will take place either Tuesday, August 6th or Wednesday, August 7th, with Thursday, August 8th as a fall-back date. Please note that the modelers will meet beforehand to ensure that the issues are clearly identified and on their way to resolution prior to this August meeting. [The meeting has since been changed to Wednesday, August 14, 2002, in order to accommodate everyone's schedules.]

- **Complete copy of Consent Decree to MDEQ:** John J. O'Grady will send one complete copy of the signed Consent Decree to Rob Franks of MDEQ as soon as it is available.

Table 3 - Issues

Issue	Currently Affects Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
(1) Status and contents of A-SOW	N	Y
(2) Monitoring well completion methodology	?	?
(3) Saginaw aquifer cleanup	Y	Y
(4) Additional Saginaw aquifer characterization	Y	Y
(5) Glacial aquifer	Y	Y
(6) Monitoring data adequacy for plume verification	Y	Y
(7) Team communication	N	N

IX. Recommendations and Follow-Up Actions

Table 4 - Recommendations and Follow-Up Actions

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
60% Design	Submit 60% Design to City of Lansing	Goodyear	City of Lansing, MI	Third Week of August 2002	Y	Y
SEW-3 & SEW-4 Installation/ Operation	Submit Revised Time Line To U.S. EPA	Goodyear	U.S. EPA /MDEQ	ASAP	Y	Y
SEW-3 & SEW-4 Installation/ Operation	Submit Revised Time-line To U.S. EPA	Goodyear	U.S. EPA /MDEQ	ASAP	Y	Y
Northeast Aquifer Characterization	Review Information And Make Recommendations	Goodyear	U.S. EPA /MDEQ	August 2002 Modeling Meeting	Y	Y
Additional Saginaw Aquifer Characterization	Review Quarterly Monitoring Data Once SEW-3 & SEW-4 Installed/Operational	Goodyear	U.S. EPA /MDEQ	2003-2004	?	?

Table 4 - Recommendations and Follow-Up Actions (Continued)

Issue	Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Well Sampling Accessibility	Ensure That Wells 25-14, 25-18, 25-20, & 25-26 Are Accessible for Sampling	BWL	U.S. EPA /MDEQ	July/August 2002	?	?
Sampling Protocol	Review Groundwater Monitoring Field Sampling Standard Operating Procedures (SOPs) Prior to July/August 2002 Quarterly Sampling	Goodyear	U.S. EPA /MDEQ	July/August 2002	?	?
Well Venting In Zone 3	Review Impacts of Venting Zone 3 Wells	Goodyear	U.S. EPA /MDEQ	August 2002 Modeling Meeting	?	?
Team Communications	U.S. EPA to Initiate Bi-Weekly Conference Calls	U.S. EPA	U.S. EPA /MDEQ	July 2002	N	N
Team Communications	Quarterly Meetings of Entire Team (Goodyear, MDEQ, Sharp & Associates, U.S. EPA & USGS)	MDEQ	U.S. EPA /MDEQ	Tuesday, 09/10/2002	N	N
Team Communications	Groundwater Modeling Meeting		U.S. EPA /MDEQ	Wednesday, 08/15/2002	?	?
Team Communications	Copy of CD/A-SOW	U.S. EPA	U.S. EPA /MDEQ	As Soon As Available	N	N

X. Protectiveness Statement

The remedy is protective in the short-term. Specifically, the waste mass remedy (landfill cap, site fencing, etc.) appears to be functioning as intended, and exposure pathways that could result in unacceptable risks are being controlled. All threats at the Site have been addressed through capping of contaminated soils and the installation of fencing and warning signs.

However, current groundwater monitoring data indicate that the remedy is not functioning as required to achieve groundwater cleanup goals. Based on the existing groundwater models developed by Waterloo Hydrogeologic and other data, it is believed by Goodyear and its consultant that the installation of the two additional Saginaw aquifer Extraction Wells (SEW-3 & SEW-4) will accomplish the remedial objectives of containment of the MWDS Saginaw aquifer contamination plume, reduction in contamination mass in the plume, and protection of the BWL

production wells. The groundwater remediation system will continue to extract and treat groundwater from the perched zone, glacial and Saginaw aquifers until the cleanup standards are met.

The U.S. EPA in consultation with the MDEQ, will verify long-term protectiveness of the remedial action through the Long-Term Monitoring Plan and an evaluation of potential migration of the contaminant plume downgradient from the treatment area.

XI. Next Review

The next five-year review for the Motor Wheel Superfund Site is required by July 2007, five years from the date of this review.

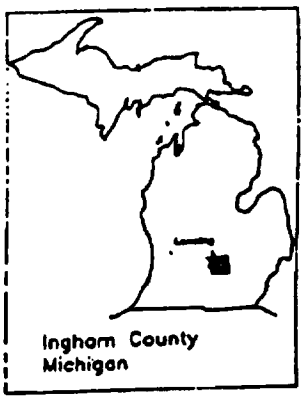
ATTACHMENT 1

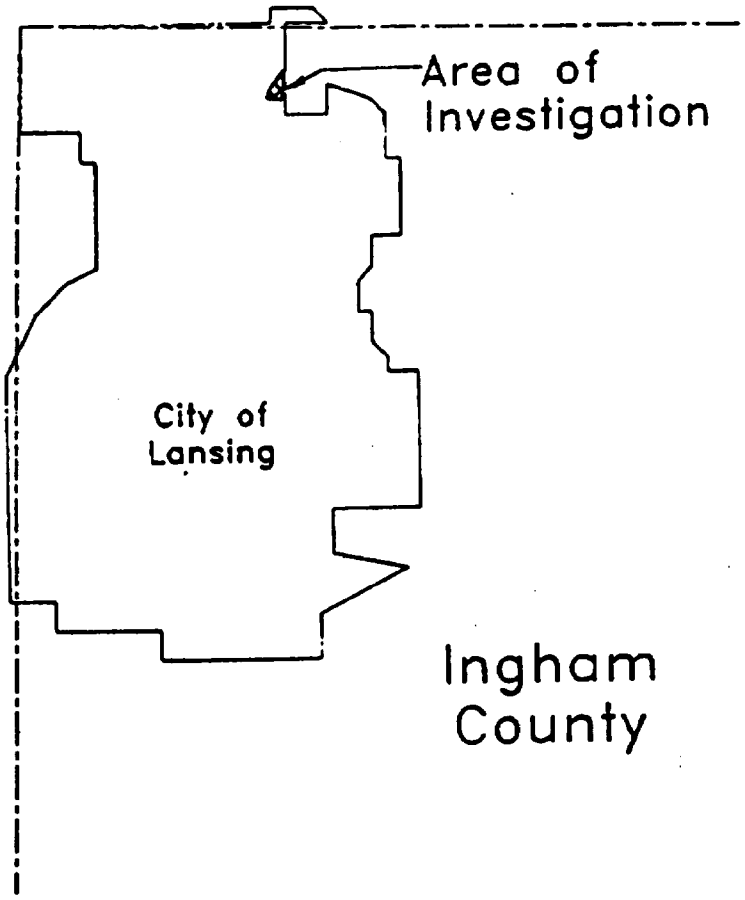
SITE MAPS

Motor Wheel Disposal Site
Lansing, Ingham County, Michigan
CERCLIS ID# MID980702989; SITE SPILL # 05S5

FIGURE2

Area of Investigation
Motor Wheel Disposal Site
T.4N., R.2W.
Lansing Township
Ingham County
Lansing, Michigan





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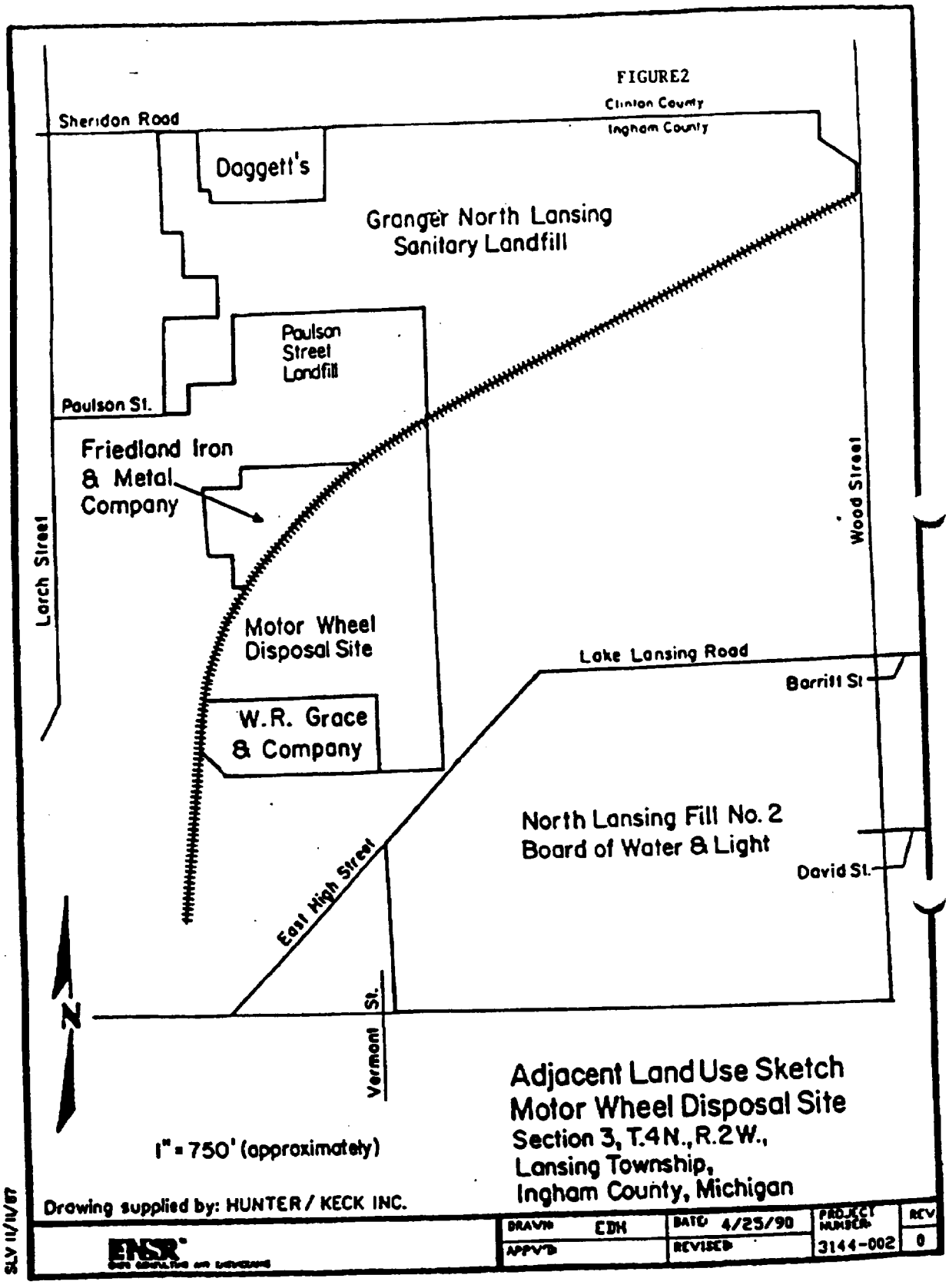
FIGURE2
Clinton County
Ingham County
Sheridon Road
Daggett's
Granger North Lansing
Sanitary Landfill
Paulson
Street
Landfill
Paulson St.
Friedland Iron
& Metal
Company
Larch Street
Wood Street
Motor Wheel
Disposal Site
Lake Lansing Road
Barritt St
W.R. Grace
& Company
North Lansing Fill No. 2
Board of Water & Light
David St.
East High Street
St.
Vermont
N
1" = 750' (approximately)
Adjacent Land Use Sketch
Motor Wheel Disposal Site
Section 3, T.4N., R.2W.,
Lansing Township,
Ingham County, Michigan
Drawing supplied by: HUNTER / KECK INC.
ENSR
DRAWN EDH
DATE 4/25/90
PROJECT NUMBER 3144-002
REV 0
APPV'D
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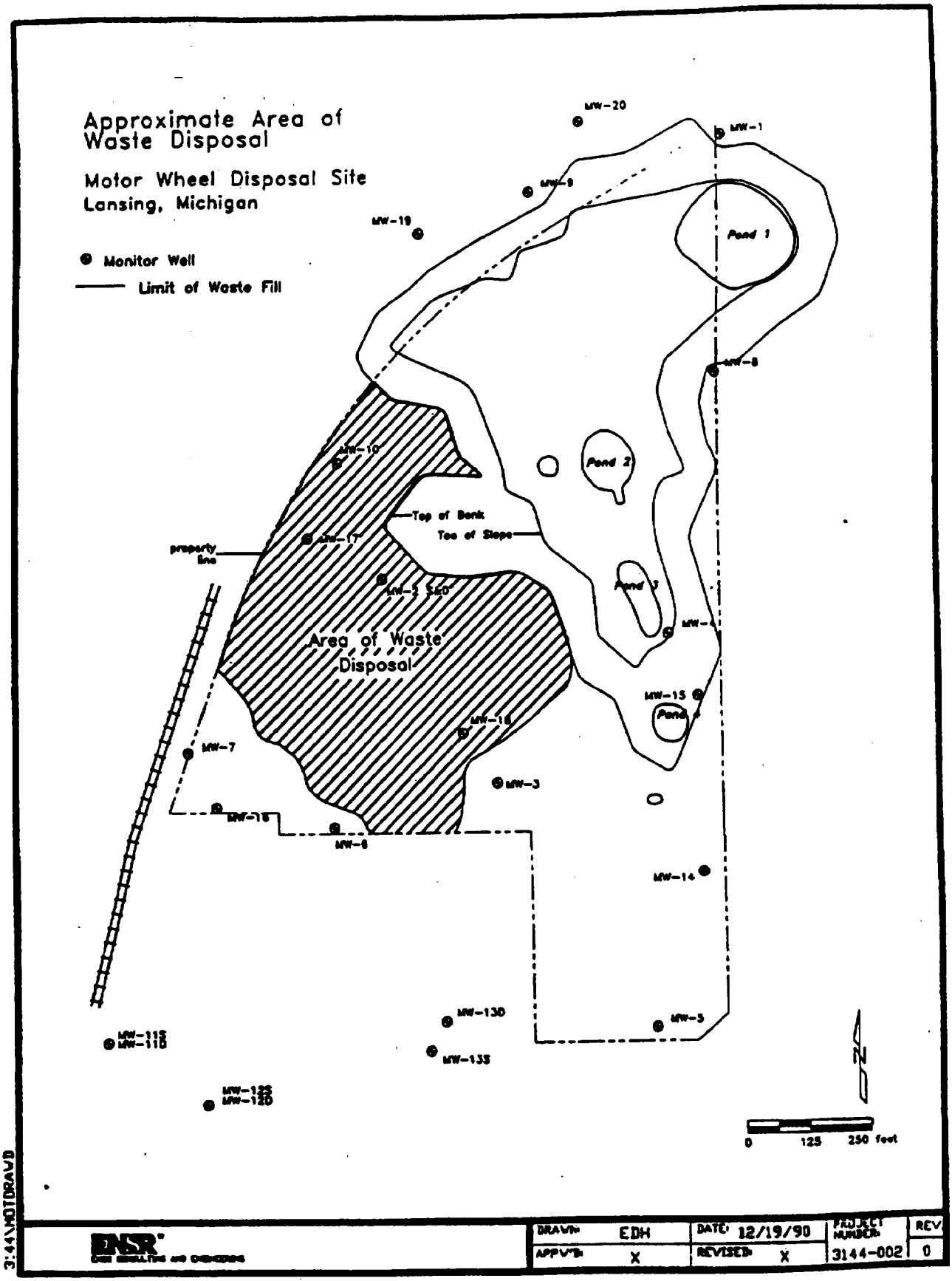
SLV 11/14/97

FIGURE 9



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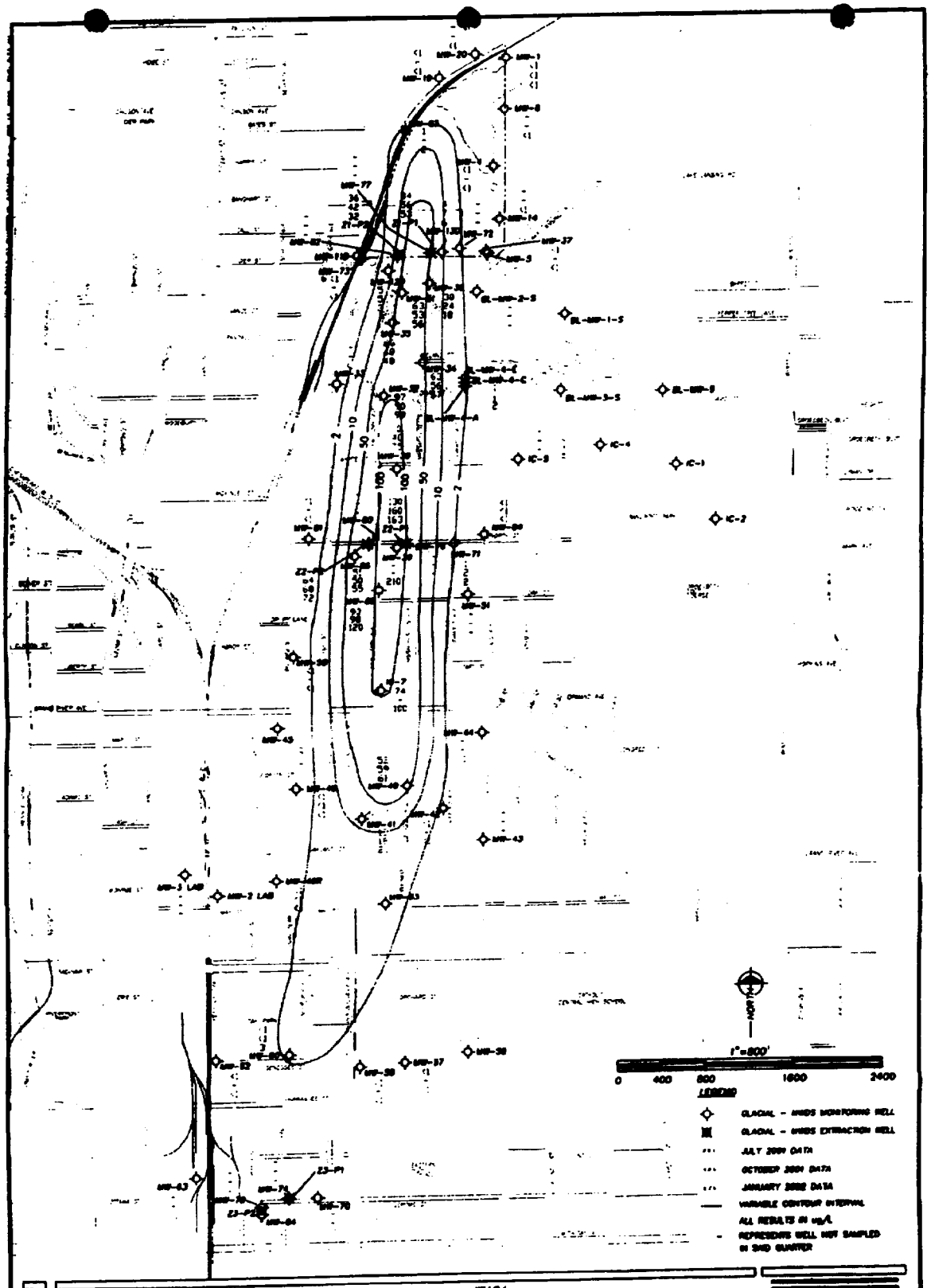
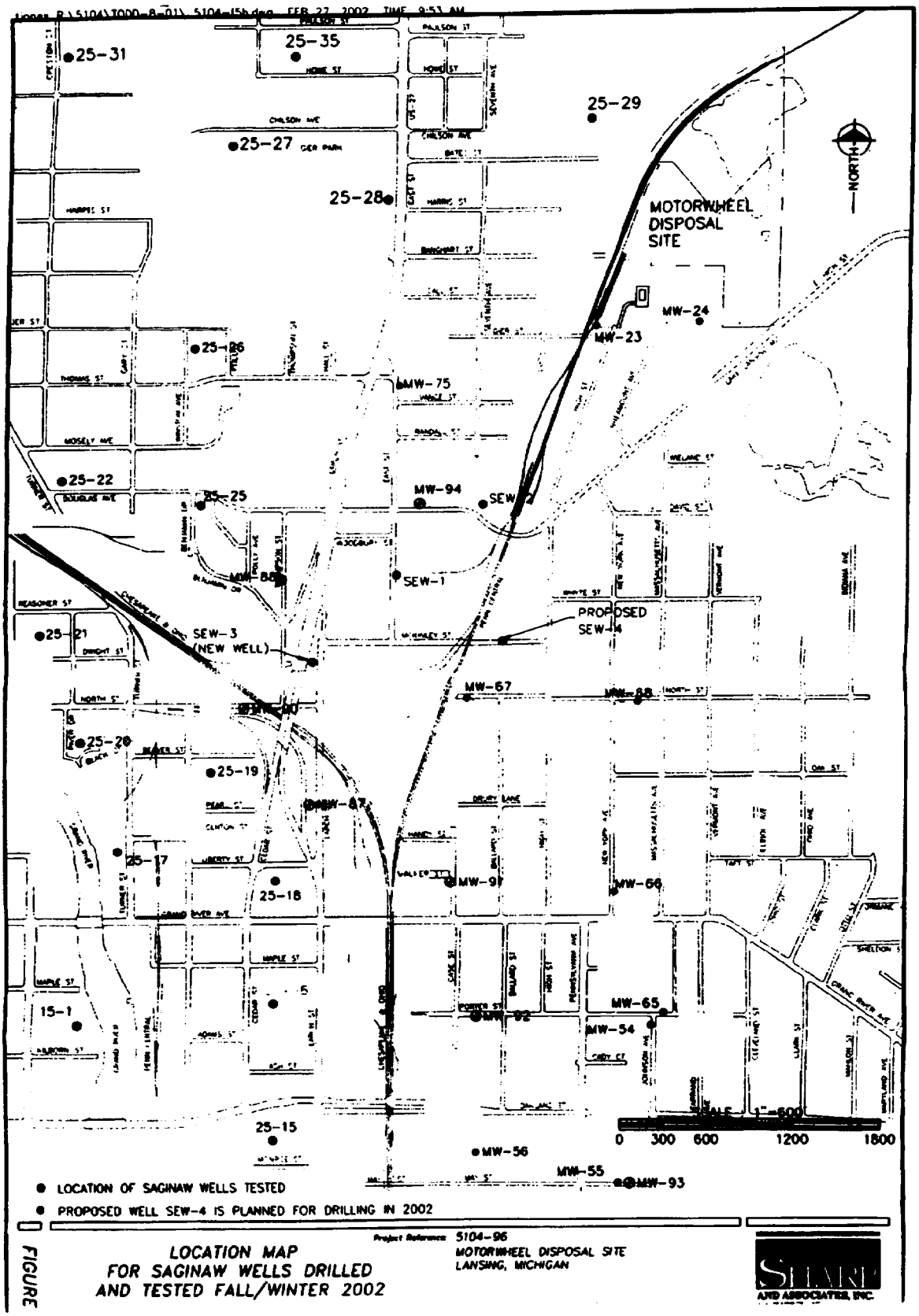
	APP'VD: X	REVISED: X		



1 GLACIAL AQUIFER
VINYL CHLORIDE
ISOCONCENTRATION MAP
JANUARY 2002 DATA

Project Reference: #5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN

SHARP AND ASSOCIATES, INC.

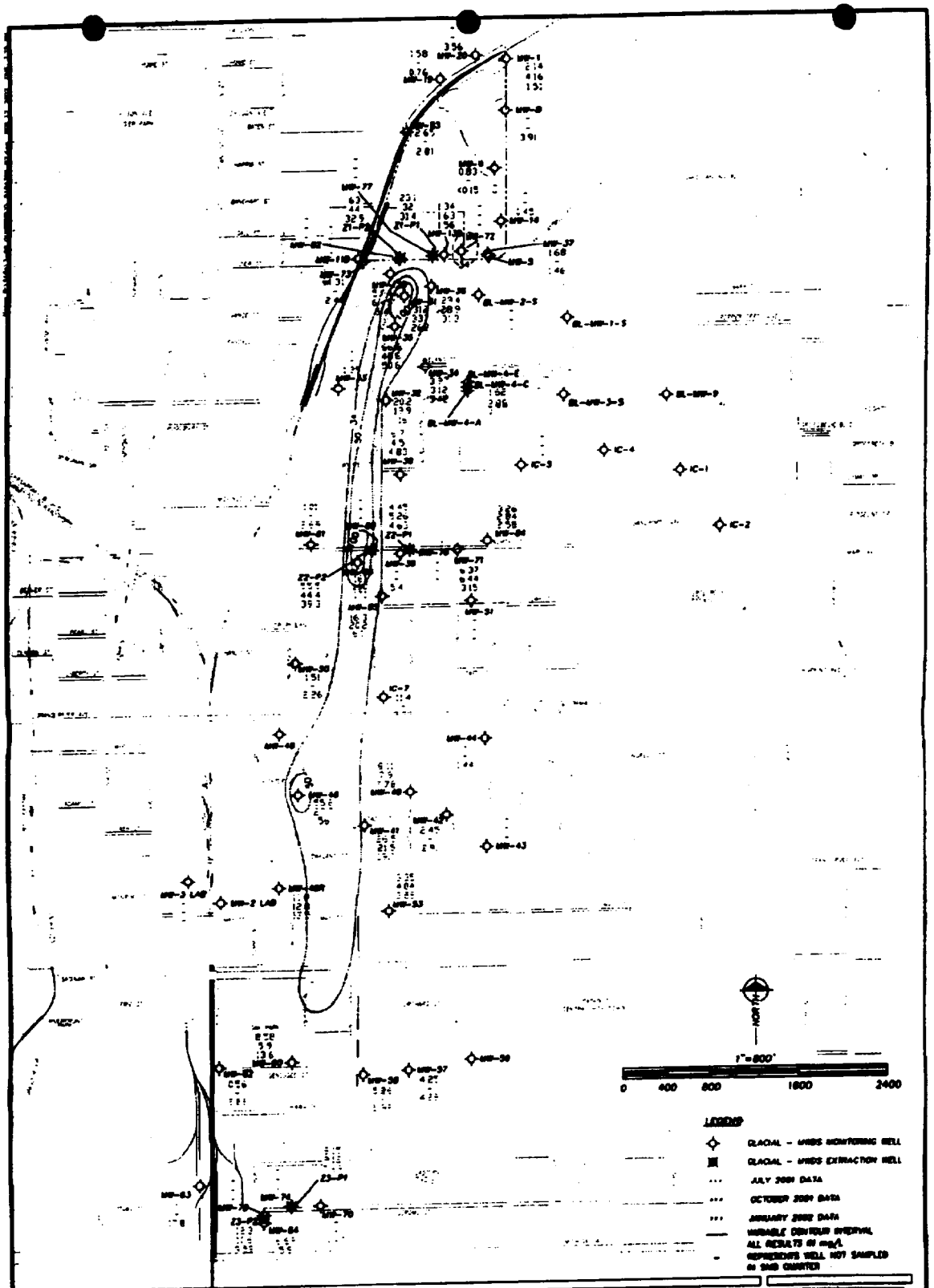


FIGURE

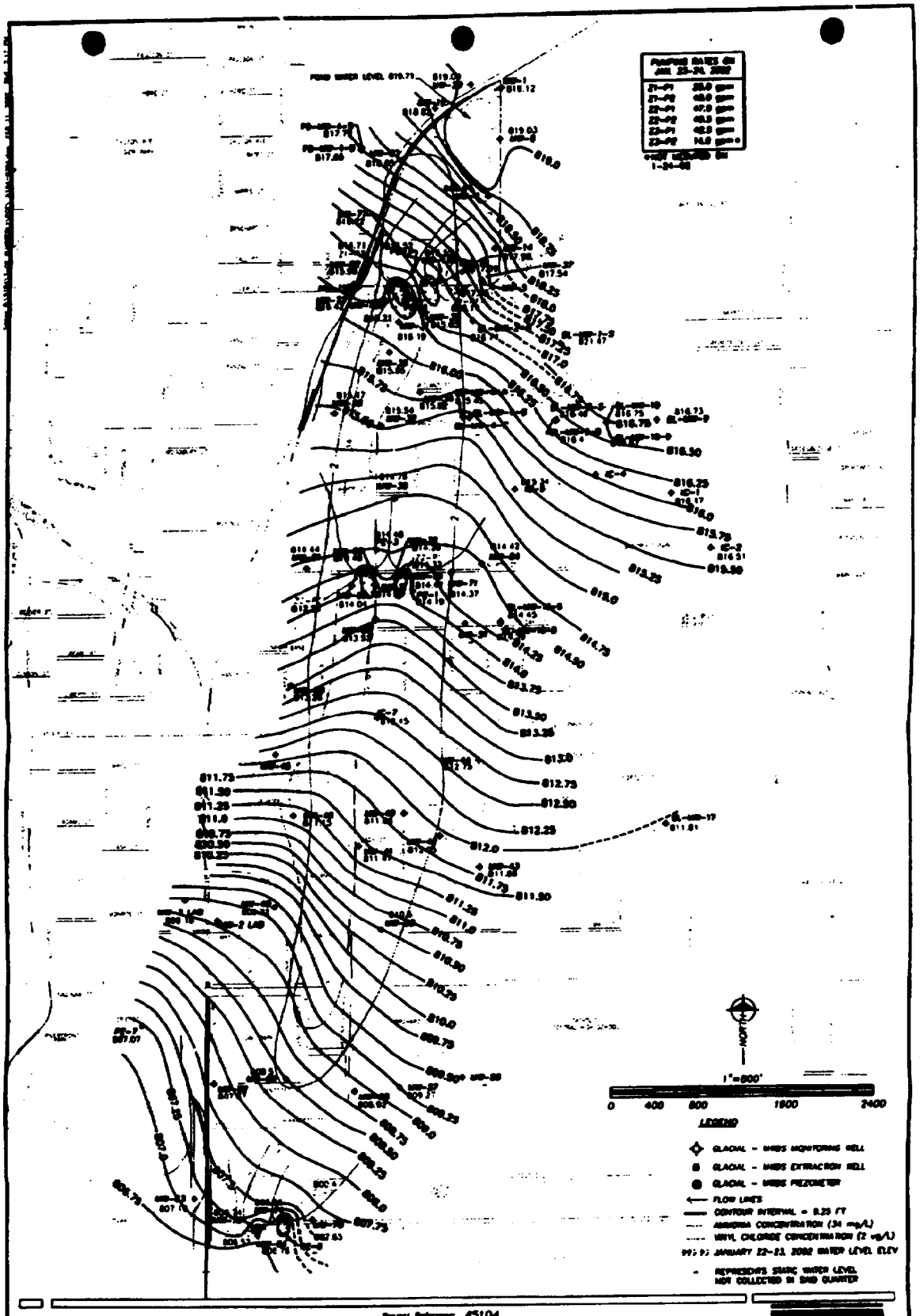
LOCATION MAP FOR SAGINAW WELLS DRILLED AND TESTED FALL/WINTER 2002

Project Reference: 5104-96
MOTORWHEEL DISPOSAL SITE
LANSING, MICHIGAN

SHARP AND ASSOCIATES, INC.



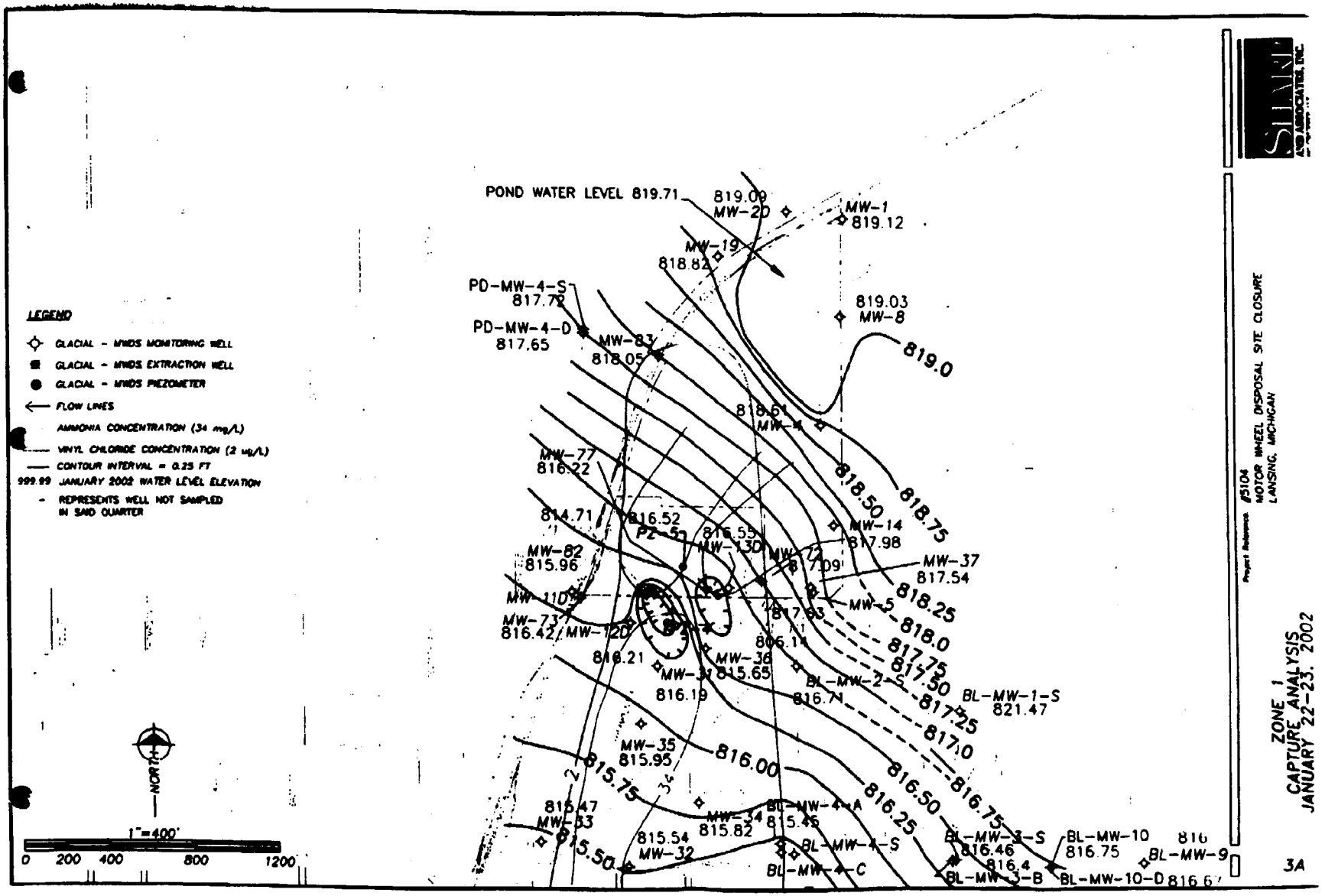
2 GLACIAL AQUIFER
AMMONIA
ISOCONCENTRATION MAP
JANUARY 2002 DATA

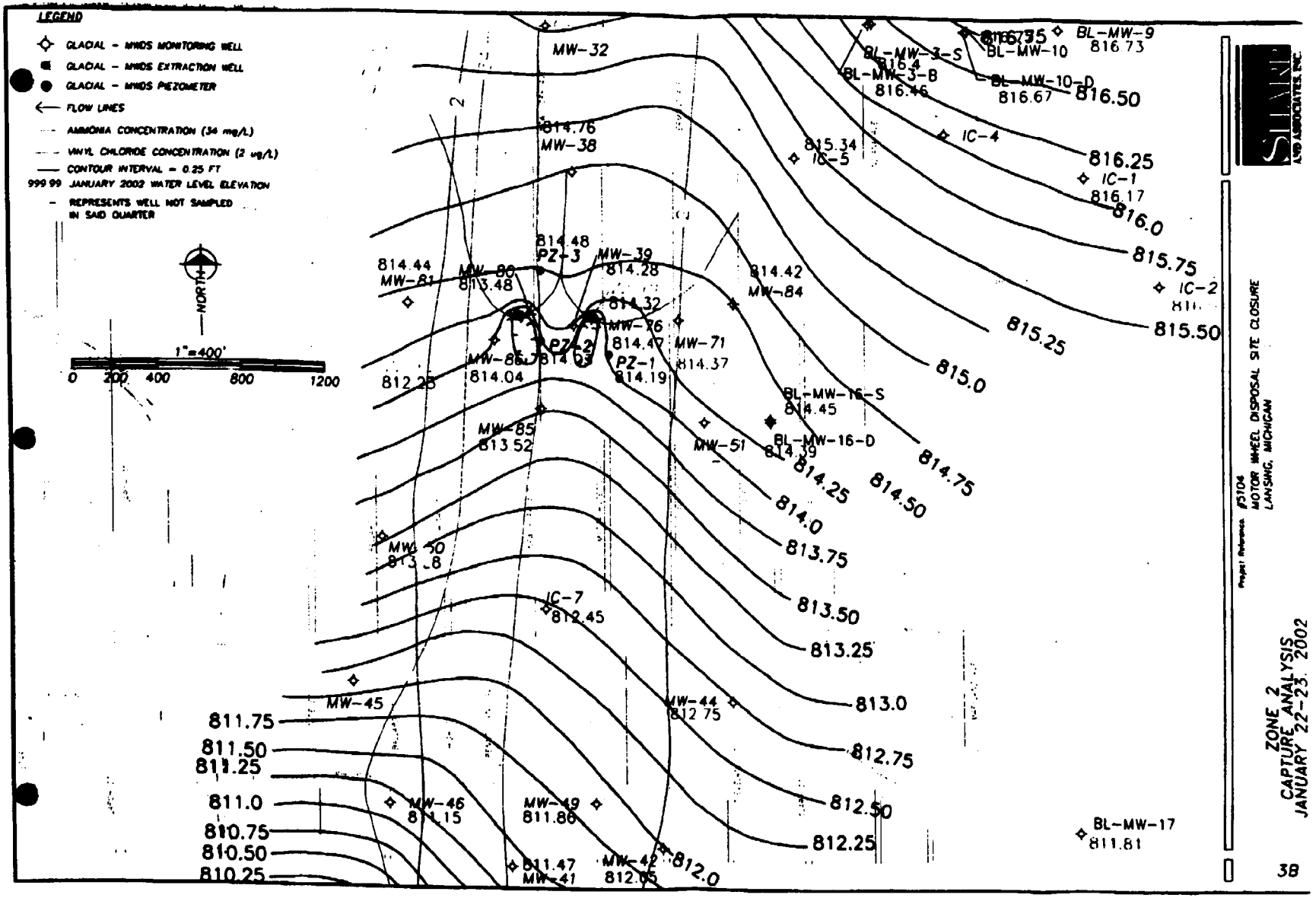


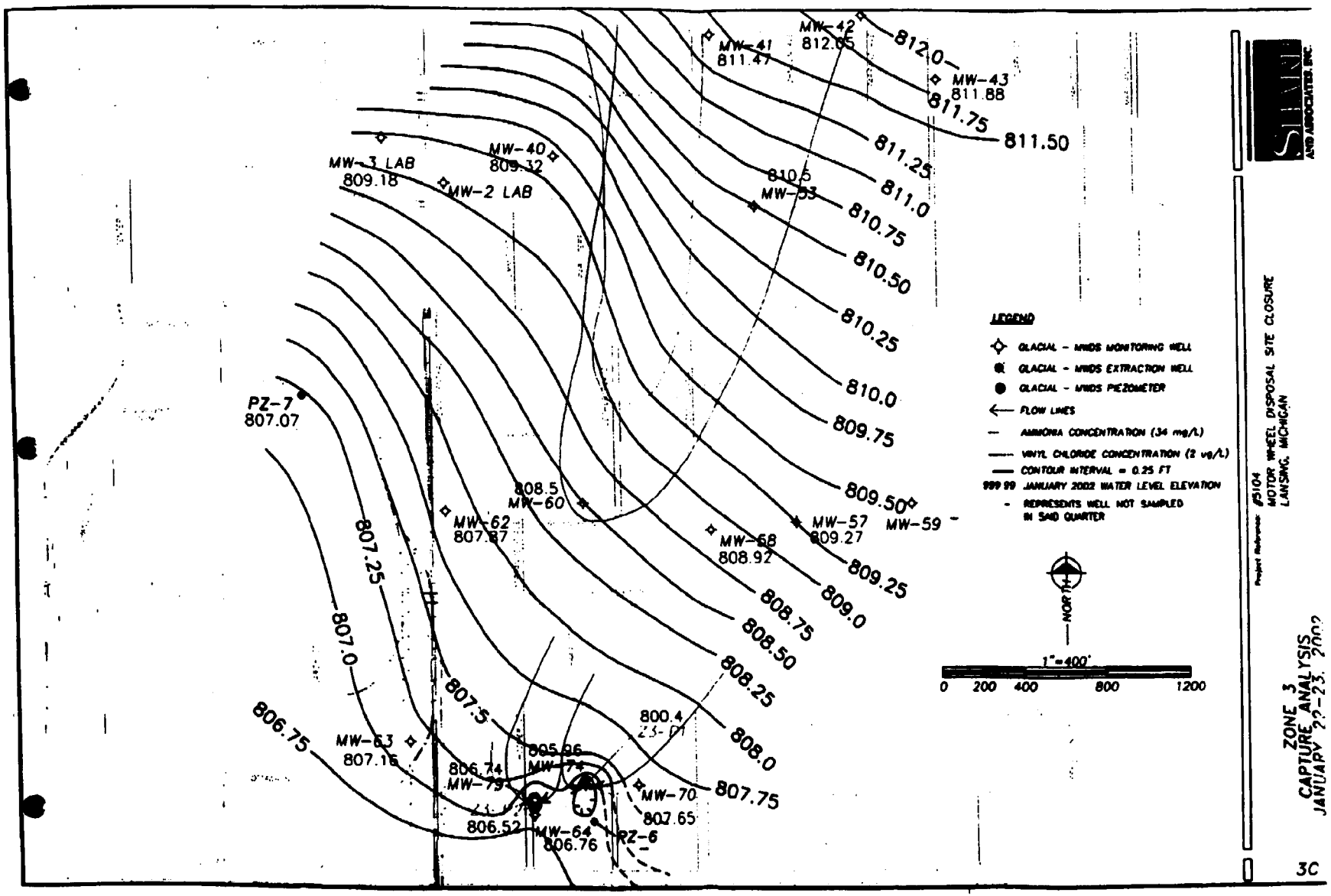
POTENTIOMETRIC SURFACE
GLACIAL AQUIFER
JANUARY 22-23, 2002

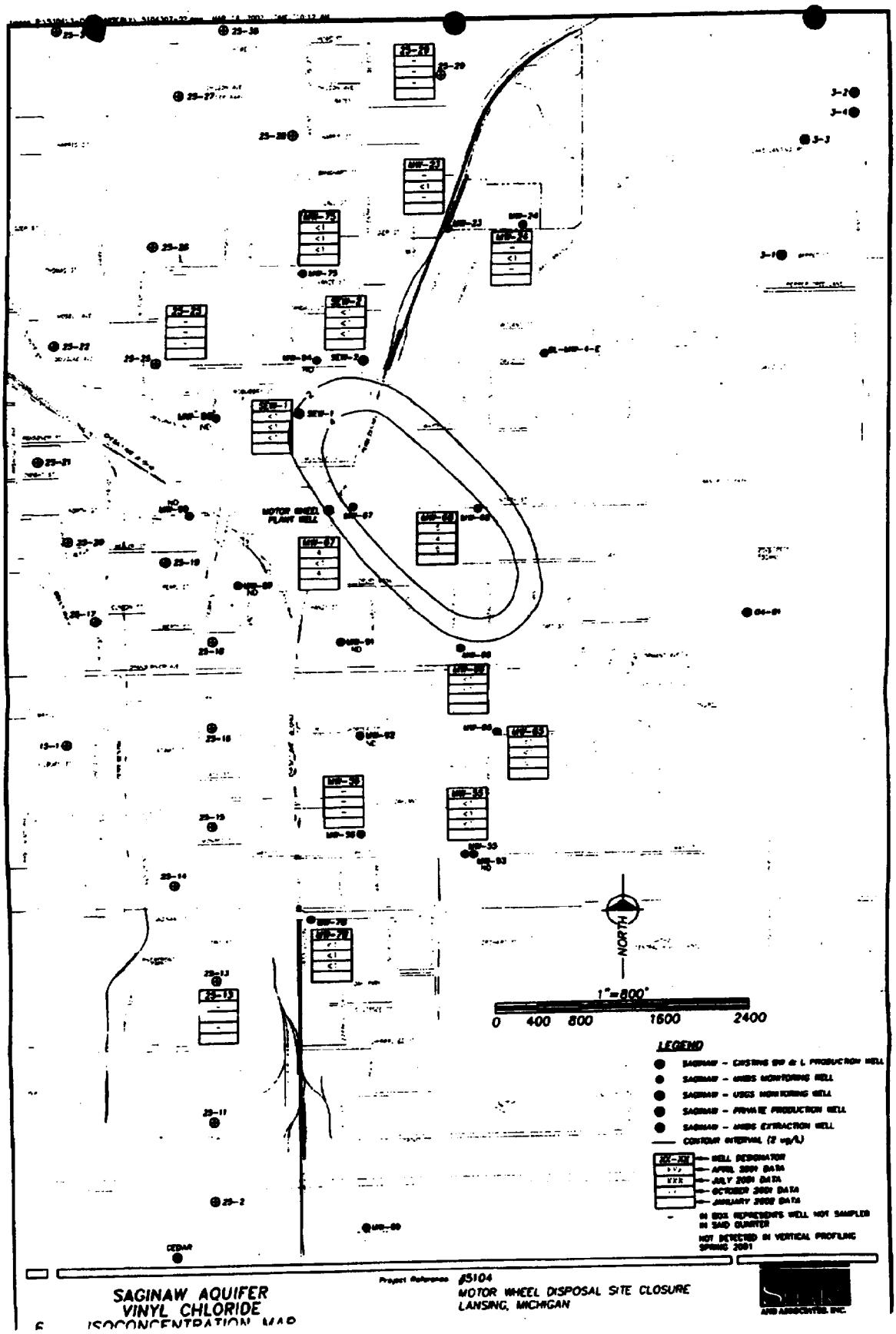
Project Reference: #5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN

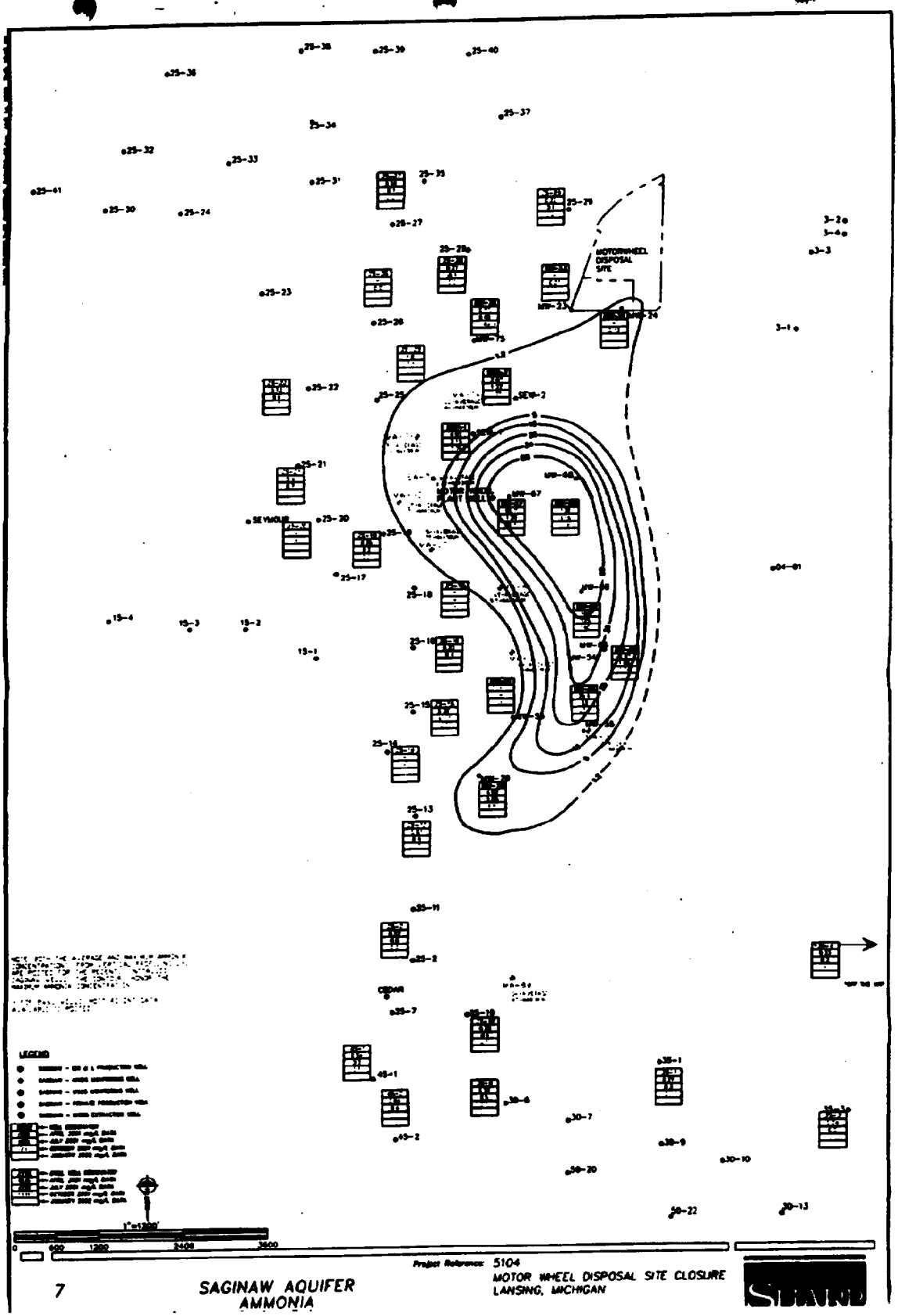
SHAW AND ASSOCIATES, INC.


LEGEND
GLACIAL - MMDS MONITORING WELL
GLACIAL - MMDS EXTRACTION WELL
GLACIAL - MMDS PIEZOMETER
FLOW LINES
AMMONIA CONCENTRATION (34 mg/L)
VINYL CHLORIDE CONCENTRATION (2 ug/L)
CONTOUR INTERVAL = 0.25 FT
999.99 JANUARY 2002 WATER LEVEL ELEVATION
- REPRESENTS WELL NOT SAMPLED IN SAID QUARTER
1"=400'
0 200 400 800 1200
POND WATER LEVEL 819.71
819.09
MW-2D
MW-1
819.12
MW-19
818.82
PD-MW-4-S
817.72
PD-MW-4-D
817.65
MW-83
818.05
819.03
MW-8
819.0
818.61
MW-4
818.50
818.75
MW-77
816.22
814.71
816.52
PZ-5
816.55
MW-13D
MW-14
817.98
MW-82
815.96
MW-12
817.09
MW-37
817.54
MW-11D
MW-5
818.25
818.0
MW-73
816.42/MW-12D
817.63
817.75
817.50
818.21
MW-36
815.65
806.14
BL-MW-2-S
817.25
BL-MW-1-S
821.47
MW-31
816.19
816.71
817.0
MW-35
815.95
816.00
815.75
816.50
816.75
816.25
815.47
MW-33
MW-34
815.82
BL-MW-4-A
815.45
BL-MW-3-S
BL-MW-10
816.75
816.46
816.4
BL-MW-9
815.50
815.54
MW-32
BL-MW-4-S
BL-MW-4-C
BL-MW-3-B
BL-MW-10-D
816.6
Project Reference #5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN
ZONE 1
CAPTURE ANALYSIS
JANUARY 22-23, 2002
3A


LEGEND
GLACIAL – MMDS MONITORING WELL
GLACIAL – MMDS EXTRACTION WELL
GLACIAL – MMDS PIEZOMETER
FLOW LINES
AMMONIA CONCENTRATION (34 mg/L)
VINYL CHLORIDE CONCENTRATION (2 ug/L)
CONTOUR INTERVAL = 0.25 FT
999.99 JANUARY 2002 WATER LEVEL ELEVATION
– REPRESENTS WELL NOT SAMPLED IN SAID QUARTER
NORTH
1"=400'
0 200 400 800 1200
MW-32
814.76
MW-38
814.48
PZ-3
MW-39
814.28
814.44
MW-81
MW-80
813.48
814.42
MW-84
814.32
MW-76
814.47
MW-71
814.37
PZ-2
814.03
PZ-1
814.19
MW-86
814.04
812.28
MW-85
813.52
MW-51
814.39
BL-MW-16-S
814.45
BL-MW-16-D
MW-50
813.18
IC-7
812.45
MW-45
MW-44
812.75
MW-46
811.15
MW-49
811.86
811.47
MW-41
MW-42
812.05
BL-MW-17
811.81
BL-MW-9
816.73
BL-MW-10
BL-MW-3-S
816.4
BL-MW-3-B
816.46
BL-MW-10-D
816.67
IC-4
815.34
IC-5
IC-1
816.17
IC-2
816.50
816.25
816.0
815.75
815.50
815.25
815.0
814.75
814.50
814.25
814.0
813.75
813.50
813.25
813.0
812.75
812.50
812.25
812.0
811.75
811.50
811.25
811.0
810.75
810.50
810.25
SHAW & ASSOCIATES, INC.
Project Reference #5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN
ZONE 2
CAPTURE ANALYSIS
JANUARY 22-23, 2002
3B


MW-42
812.65
MW-41
811.47
MW-43
811.88
812.0
811.75
811.50
811.25
811.0
810.75
810.50
810.25
810.0
809.75
809.50
809.25
809.0
808.75
808.50
808.25
808.0
807.75
807.5
807.25
807.0
806.75
MW-3 LAB
809.18
MW-40
809.32
MW-2 LAB
810.5
MW-53
PZ-7
807.07
808.5
MW-60
MW-62
807.87
MW-68
808.92
MW-57
809.27
MW-59
MW-63
807.15
805.96
MW-74
806.74
MW-79
800.4
MW-70
807.65
806.52
MW-64
806.76
PZ-6
LEGEND
GLACIAL - MWDS MONITORING WELL
GLACIAL - MWDS EXTRACTION WELL
GLACIAL - MWDS PIEZOMETER
FLOW LINES
AMMONIA CONCENTRATION (34 mg/L)
VINYL CHLORIDE CONCENTRATION (2 ug/L)
CONTOUR INTERVAL = 0.25 FT
999.99 JANUARY 2002 WATER LEVEL ELEVATION
- REPRESENTS WELL NOT SAMPLED IN SAID QUARTER
NORTH
1"=400'
0 200 400 800 1200
Project Reference #5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN
ZONE 3
CAPTURE ANALYSIS
JANUARY 22-23, 2002
3C

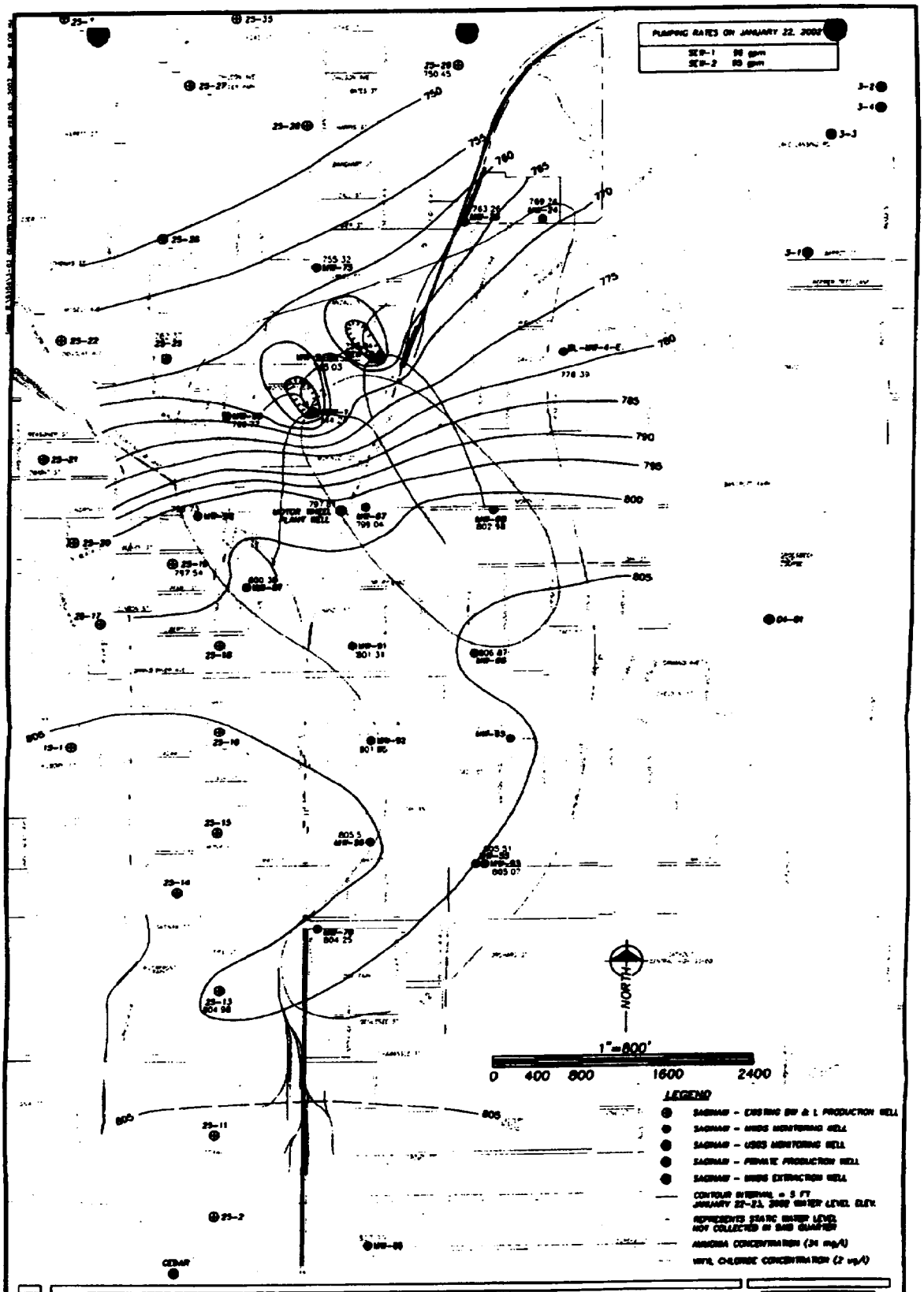

NORTH
1"=800'
0 400 800 1600 2400
LEGEND
CEDAR
Project Reference #5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN
SAGINAW AQUIFER
VINYL CHLORIDE



7

SAGINAW AQUIFER
AMMONIA

Project Reference: 5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN



8 POTENTIOMETRIC SURFACE SAGINAW AQUIFER JANUARY 22-23, 2002

Project Reference: #5104
MOTOR WHEEL DISPOSAL SITE CLOSURE
LANSING, MICHIGAN

AND ASSOCIATES, INC.

ATTACHMENT 2

List of Documents Reviewed

- *Remedial Investigation/Feasibility Study (RI/FS), Motor Wheel Superfund Site*, September 30, 1991.
- *Record of Decision, Motor Wheel Superfund Site*, September 30, 1991.
- *Remedial Design, Motor Wheel Superfund Site*, June 26, 1997.
- *Preliminary Close-Out Report (PCOR), Motor Wheel Superfund Site*, 12/18/1997.
- *The Investigation of the Saginaw Aquifer at the Motor Wheel Disposal Site*, March 13, 1998.
- *Motor Wheel Superfund Site Operations & Maintenance Plan*, September 18, 1998.
- *Impact of Excess Ammonia on Dye Water Conditioning Plant, Final Report*, January 20, 1999; Prepared by Camp Dresser & McKee for the Lansing Board of Water & Light.
- *Final Risk Assessment Submittal, Saginaw Aquifer, Motor Wheel Disposal Site, Lansing, Michigan;* June 22, 2000.
- *Explanation of Significant Differences, Motor Wheel Superfund Site*, July 12, 2001.
- *Remedial Design Modifications, Expansion of Existing Groundwater Extraction and Treatment System at the Motor Wheel Disposal Site, Lansing, Michigan*; Prepared by Sharp & Associates, Inc. on behalf of Goodyear Tire & Rubber Company, October 12, 2001.
- *Draft Transmittal Report of the Saginaw Aquifer 2001/2002 Drilling and Testing Program at the Motor Wheel Disposal Site (MWDS) Lansing, Michigan*; Prepared by Sharp & Associates, Inc. on behalf of Goodyear Tire & Rubber Company, March 25, 2002.
- *First Quarter 2002 Monitoring Report for the Motor Wheel Disposal Site, Lansing, MI*; Prepared by Sharp & Associates, Inc. on behalf of Goodyear Tire & Rubber Company; April 29, 2002.
- Final Amended Consent Decree and Amended Scope of Work, May 2002.

ATTACHMENT 3

MONITORING DATA

Motor Wheel Disposal Site
Lansing, Ingham County, Michigan
CERCLIS ID# MID980702989; SITE SPILL # 05S5

Table 1. Water Levels Recorded January 22-23, 2002 at the Motor Wheel Disposal Site, Lansing MI

Well	Aquifer Screened	Measuring Point Elevation	Depth to Water	Date	Potentiometric Surface elevation (AMSL)
25-13	Saginaw	840.32	35.34	1/22/02	804.98
25-19	Saginaw	842.54	45	1/22/02	797.54
25-25	Saginaw	861.10	98.73	1/22/02	762.37
25-29	Saginaw	864.70	114.25	1/22/02	750.45
BL-MW-01SR	Glacial	863.77	42.3	1/22/02	821.47
BL-MW-02S	Glacial	880.92	64.21	1/22/02	816.71
BL-MW-03B	Glacial	854.65	38.25	1/22/02	816.40
BL-MW-03S	Glacial	855.11	38.65	1/22/02	816.46
BL-MW-04A	Glacial	865.59	50.14	1/22/02	815.45
BL-MW-04E	Saginaw	866.30	87.91	1/22/02	778.39
BL-MW-09	Glacial	868.63	51.9	1/22/02	816.73
BL-MW-10	Glacial	867.03	50.28	1/22/02	816.75
BL-MW-10D	Glacial	867.04	50.37	1/22/02	816.67
BL-MW-16D	Glacial	884.31	69.92	1/22/02	814.39
BL-MW-16S	Glacial	884.41	69.96	1/22/02	814.45
BL-MW-17	Glacial	849.31	37.5	1/22/02	811.81
IC-01	Glacial	863.77	47.6	1/23/02	816.17
IC-02	Glacial	865.71	49.2	1/23/02	816.51
IC-05	Glacial	868.94	53.6	1/23/02	815.34
IC-07	Glacial	864.40	51.95	1/22/02	812.45
MW-01	Glacial	879.03	59.91	1/22/02	819.12
MW-03 LAB	Glacial	842.87	33.69	1/22/02	809.18
MW-04	Glacial	825.48	6.87	1/22/02	818.61
MW-05R	Glacial	877.11	56	1/23/02	821.11
MW-08	Glacial	873.58	54.55	1/23/02	819.03
MW-12D	Glacial	879.20	62.99	1/23/02	816.21
MW-12S	Perched	879.57	15.69	1/23/02	863.88
MW-13D	Glacial	873.23	56.68	1/23/02	816.55
MW-13S	Perched	879.94	18.95	1/23/02	860.99
MW-14	Glacial	870.66	52.68	1/22/02	817.98
MW-15	Perched	855.17	*	*	*
MW-19	Glacial	869.30	50.48	1/22/02	818.82
MW-20	Glacial	874.82	55.73	1/22/02	819.09
MW-23	Saginaw	872.58	109.32	1/23/02	763.26
MW-24	Saginaw	872.46	103.22	1/23/02	769.24
MW-26	Perched	877.54	12.6	1/23/02	864.94
MW-31R	Glacial	878.32	61.59	1/23/02	816.73
MW-32	Glacial	866.79	51.25	1/23/02	815.54
MW-33	Glacial	858.87	43.4	1/23/02	815.47
MW-34	Glacial	865.09	49.27	1/23/02	815.82
MW-35	Glacial	875.42	59.47	1/23/02	815.95
MW-36	Glacial	876.97	61.32	1/23/02	815.65
MW-37R	Glacial	876.18	54.65	1/23/02	821.53

Table 1. Water Levels Recorded January 22-23, 2002 at the Motor Wheel Disposal Site, Lansing MI

Well	Aquifer Screened	Measuring Point Elevation	Depth to Water	Date	Potentiometric Surface elevation (AMSL)
MW-38	Glacial	873.10	58.34	1/23/02	814.76
MW-39	Glacial	876.42	62.14	1/23/02	814.28
MW-40RR	Glacial	844.78	35.46	1/23/02	809.32
MW-41	Glacial	854.97	43.5	1/23/02	811.47
MW-42	Glacial	863.80	51.75	1/23/02	812.05
MW-43R	Glacial	871.49	59.3	1/23/02	812.19
MW-44R	Glacial	866.67	53.6	1/23/02	813.07
MW-45	Glacial	842.24	*	*	*
MW-46	Glacial	842.11	30.96	1/23/02	811.15
MW-49	Glacial	851.88	40.02	1/23/02	811.86
MW-50	Glacial	839.52	26.24	1/23/02	813.28
MW-51	Glacial	889.21	*	*	*
MW-53R	Glacial	860.94	49.9	1/22/02	811.04
MW-54	Saginaw	852.00	40.2	1/23/02	811.80
MW-55	Saginaw	860.13	54.62	1/22/02	805.51
MW-56	Saginaw	846.72	41.22	1/22/02	805.50
MW-57	Glacial	879.00	69.73	1/22/02	809.27
MW-58	Glacial	869.72	60.8	1/22/02	808.92
MW-60	Glacial	862.29	53.79	1/22/02	808.50
MW-62	Glacial	842.76	34.89	1/22/02	807.87
MW-63	Glacial	845.49	38.33	1/22/02	807.16
MW-64	Glacial	857.47	50.71	1/22/02	806.76
MW-65	Saginaw	851.58	49.35	1/23/02	802.23
MW-66	Saginaw	864.66	57.79	1/22/02	806.87
MW-67	Saginaw	851.16	52.12	1/23/02	799.04
MW-68	Saginaw	875.69	72.71	1/23/02	802.98
MW-70	Glacial	866.39	58.74	1/22/02	807.65
MW-71	Glacial	887.10	72.73	1/23/02	814.37
MW-72	Glacial	874.82	57.73	1/23/02	817.09
MW-73	Glacial	868.17	51.75	1/23/02	816.42
MW-74	Glacial	863.96	58	1/22/02	805.96
MW-75	Saginaw	869.63	114.31	1/23/02	755.32
MW-76	Glacial	878.10	63.63	1/23/02	814.47
MW-77	Glacial	873.88	57.66	1/23/02	816.22
MW-78	Saginaw	824.37	20.12	1/23/02	804.25
MW-79	Glacial	858.68	51.94	1/22/02	806.74
MW-80	Glacial	871.90	58.42	1/23/02	813.48
MW-81	Glacial	855.69	41.25	1/23/02	814.44
MW-82	Glacial	877.79	61.83	1/23/02	815.96
MW-83	Glacial	868.06	50.01	1/23/02	818.05
MW-84	Glacial	890.42	76	1/23/02	814.42
MW-85	Glacial	870.00	56.48	1/23/02	813.52
MW-86	Glacial	867.96	53.92	1/23/02	814.04

Table 1. Water Levels Recorded January 22-23, 2002 at the Motor Wheel Disposal Site, Lansing MI

Well	Aquifer Screened	Measuring Point Elevation	Depth to Water	Date	Potentiometric Surface elevation (AMSL)
MW-87	Saginaw	842.58	42.2	1/23/02	800.38
MW-88	Saginaw	853.32	83.55	1/23/02	769.77
MW-89	Saginaw	866.42	62.43	1/22/02	803.99
MW-90	Saginaw	842.58	43.85	1/23/02	798.73
MW-91	Saginaw	835.62	34.31	1/23/02	801.31
MW-92	Saginaw	840.93	39.08	1/23/02	801.85
MW-93	Saginaw	859.77	54.7	1/22/02	805.07
MW-94	Saginaw	871.29	106.26	1/23/02	765.03
PD-MW-04-D	Glacial	865.74	48.09	1/22/02	817.65
PD-MW-04-S	Glacial	864.91	47.19	1/22/02	817.72
Perched	Perched	871.15	20.53	1/23/02	850.62
Plant Well	Saginaw	846.76	48.95	1/24/02	797.81
POND	Glacial	821.51	1.8	1/23/02	819.71
PZ-01	Glacial	882.05	67.86	1/23/02	814.19
PZ-02	Glacial	873.61	59.58	1/23/02	814.03
PZ-03	Glacial	869.38	54.9	1/23/02	814.48
PZ-04	Glacial	878.35	*	*	*
PZ-05	Glacial	871.33	54.81	1/23/02	816.52
PZ-06	Glacial	865.81	14.29	1/22/02	851.52
PZ-07	Glacial	834.88	27.81	1/22/02	807.07
SEW-01	Saginaw	870.46	126.22	1/23/02	744.24
SEW-02	Saginaw	857.25	103.41	1/23/02	753.84
TEW-02R	Perched	870.04	24.04	1/23/02	846.00
Z1-P1	Glacial	868.10	61.96	1/23/02	806.14
Z1-P2	Glacial	871.19	56.48	1/23/02	814.71
Z2-P1	Glacial	874.94	60.62	1/24/02	814.32
Z2-P2	Glacial	869.29	57.06	1/24/02	812.23
Z3-P1	Glacial	861.50	61.1	1/23/02	800.40
Z3-P2	Glacial	855.80	49.28	1/23/02	806.52

☐ MWDS Monitoring Well with dedicated low-flow pump.

Notes
* Could not locate, well under investigation.

TABLE 2
PRODUCTION INFORMATION FOR EXTRACTION WELLS
Fourth Quarter 2001 Motor Wheel Disposal Site, Lansing, Michigan

Well Number	October Gallons	OPERATIONAL DAYS October	November Gallons	OPERATIONAL DAYS November	December Gallons	OPERATIONAL DAYS December
Zone 1						
Z1-P1	1,071,700	20.9	1,017,600	25 5	1,000,400	26 0
Z1-P2	2,066,700	20.9	1,876,300	25 5	1,863,000	26 0
Perched Well	28,500	3 5	100,800	15 9	38,300	6 0
Zone 2						
Z2-P1	1,551,100	16.0	646,300	8.2	1,282,600	18 0
Z2-P2	1,604,300	18 4	947,600	12 4	1,759,600	23 0
Zone 3						
Z3-P1	551,200	10 4	1,622,200	30	1,505,300	27 0
Z3-P2	167,500	4 4	402,624	15 5	473,300	19 0
Saginaw Zones						
SEW-1	3,295,100	21.3	2,552,600	20 6	2,104,100	11 0
SEW-2	3,056,900	19 2	3,331,200	25 5	865,700	6 0
TOTAL GLACIAL ZONE WELLS	7,041,000		6,613,424		7,922,500	
TOTAL SAGINAW WELLS	6,352,000		5,883,800		2,969,800	
TOTAL EXTRACTED	13,393,000		12,497,224		10,892,300	

TREATMENT PLANT	October	November	December
OUTFALL 001			
Avg. inlet concentration, vinyl chloride (ug/l)	24 6	12	38 0
Avg. effluent concentration, ammonia (mg/l)	27 9	20 6	37 5
Avg. Effluent concentration, vinyl chloride (ug/l)	<1	<1	<1
Percent reduction by treatment	100	100	100
Estimated total vinyl chloride Removed (lbs.)	2 84	0 81	2 92
Estimated average vinyl chloride removed (lbs /day)	0 09	0 03	0 09
Estimated total ammonia Removed (lbs) *****	3,270 7	2,537 3	2,912 8
Estimated average ammonia removed (lbs /day)	105 5	84 6	94.0
OUTFALL 001 Total Flow (Meter at FT-14)*	13,808,000	10,789,600	9,202,900
OUTFALL 001 System Average Flow Rate**	309 3	250	206 2
OUTFALL 001 Days of Operation	27.6	26.7	22.9
OUTFALL 001 System Uptime Average Flow Rate***	347 4	281	279
OUTFALL 002			
Avg. Ammonia Effluent concentration (mg/l)****	6.8	9.1	8.9
Estimated total Ammonia Removed (lbs.)	41 0	156.1	147.1
Estimated average Ammonia removed (lbs./day)	1 3	5.2	4.7
OUTFALL 002 Total Flow	718,700	2,024,824	1,978,600
OUTFALL 002 System Average Flow Rate (gpm)**	16	47	45
OUTFALL 002 Days of Operation	13 4	29.8	27
OUTFALL 002 System Uptime Average Flow Rate ***	37	47	51

Mass Removed in Pounds	
229.6	Outfall 001 Cumulative Vinyl Chloride removed through 9/30/01
6.6	Outfall 001 Vinyl Chloride removed 4th quarter 2001
236.2	Outfall 001 Cumulative Vinyl Chloride removed through 12/31/01
150,527.4	Outfall 001 Cumulative Ammonia removed through 9/30/01
8,720.8	Outfall 001 Ammonia Removed 4th quarter 2001
159,248.2	Outfall 001 Cumulative Ammonia removed through 12/31/01
12,910.1	Outfall 002 Cumulative Ammonia removed through 9/30/01
344.2	Outfall 002 Ammonia Removed4th quarter 2001
13,254.3	Outfall 002 Cumulative Ammonia removed through 12/31/01

Gallons of Water Produced	
570,108,900	Outfall 001 Cumulative water treated through 9/30/01
33,800,800	Outfall 001 Water treated 4th quarter 2001
604,009,400	Outfall 001 Cumulative water treated through 12/31/01
114,981,900	Outfall 002 Cumulative water treated through 9/30/01
4,722,124	Outfall 002 Water treated 4th quarter 2001
119,704,024	Outfall 002 Cumulative water treated through 12/31/01
723,713,424	TOTAL GROUNDWATER TREATED through 12/31/01

* Note, the Total flow through FT-14 used for NPDES permit compliance may differ from the summation of individual extraction well totals due to meter inaccuracies
**System average flow is calculated by dividing the total flow by the calendar period
*** Uptime average flow presented is the average flow during operational days
**** the effluent values for Outfall 001 and 002 represent the average ammonia concentrations in mg/l
*****Ammonia mass for 001 in Dec 1999 was calculated by summation of the daily effluent ammonia totals This new method of calculation represents reporting on NPDES reporting forms
Previous totals were calculated using FT-14 flow rate and average daily ammonia concentration

TABLE 3
PRODUCTION INFORMATION FOR EXTRACTION WELLS
First Quarter 2002 Motor Wheel Disposal Site, Lansing, Michigan

Well Number	January Gallons	OPERATIONAL DAYS January	February Gallons	OPERATIONAL DAYS February	March Gallons	OPERATIONAL DAYS March
Zone 1						
Z1-P1	1,044,600	28.7	930,700	26.9	977,000	29.3
Z1-P2	2,001,300	28.7	1,867,300	26.9	1,928,600	29.3
Perched Well	94,200	14.4	78,300	11.7	111,000	17.0
Zone 2						
Z2-P1	1,543,500	21.9	1,906,100	26.7	2,030,200	29.2
Z2-P2	2,088,500	28.6	1,906,800	26.7	1,760,300	29.2
Zone 3						
Z3-P1	1,686,000	29.1	1,438,700	25.6	1,698,000	30.9
Z3-P2	455,700	18.5	554,800	20.5	820,100	30.7
Saginaw Zones						
SEW-1	2,737,100	19.6	3,719,000	26.8	4,016,100	29.2
SEW-2	1,035,500	7.5	1,180,300	8.5	1,325,100	9.4
TOTAL GLACIAL ZONE WELLS	8,913,800		8,682,700		9,325,200	
TOTAL SAGINAW WELLS	3,772,600		4,899,300		5,341,200	
TOTAL EXTRACTED	12,686,400		13,582,000		14,666,400	

TREATMENT PLANT	January	February	March
OUTFALL 001			
Avg. Inlet concentration, vinyl chloride (ug/l)	38.4	47	39.8
Avg. effluent concentration, ammonia (mg/l)	36.4	29.7	30.5
Avg. Effluent concentration, vinyl chloride (ug/l)	<1	<1	<1
Percent reduction by treatment	100	100	100
Estimated total vinyl chloride Removed (lbs.)	3.70	4.71	4.31
Estimated average vinyl chloride removed (lbs /day)	0.12	0.17	0.14
Estimated total ammonia Removed (lbs.) *****	3,369.3	2,934.5	3,418.0
Estimated average ammonia removed (lbs /day)	108.7	104.8	110.3
OUTFALL 001 Total Flow (Meter at FT-14)*	11,551,400	12,000,200	12,983,300
OUTFALL 001 System Average Flow Rate**	258.8	298	290.8
OUTFALL 001 Days of Operation	28.8	26.9	28.6
OUTFALL 001 System Uptime Average Flow Rate***	278.5	310	315
OUTFALL 002			
Avg. Ammonia Effluent concentration (mg/l)****	9.3	8.0	9.6
Estimated total Ammonia Removed (lbs.)	166.4	133.0	201.4
Estimated average Ammonia removed (lbs /day)	5.4	4.8	6.5
OUTFALL 002 Total Flow	2,141,700	1,993,500	2,518,100
OUTFALL 002 System Average Flow Rate (gpm)**	48	49	45
OUTFALL 002 Days of Operation	30.4	26.5	31
OUTFALL 002 System Uptime Average Flow Rate ***	49	52	57

Mass Removed in Pounds	
236.2	Outfall 001 Cumulative Vinyl Chloride removed through 12/31/01
12.7	Outfall 001 Vinyl Chloride removed 1st quarter 2002
248.9	Outfall 001 Cumulative Vinyl Chloride removed through 3/31/02
159,248.2	Outfall 001 Cumulative Ammonia removed through 12/31/01
9,721.8	Outfall 001 Ammonia Removed 1st quarter 2002
168,970.0	Outfall 001 Cumulative Ammonia removed through 3/31/02
13,254.3	Outfall 002 Cumulative Ammonia removed through 12/31/01
500.8	Outfall 002 Ammonia Removed 1st quarter 2002
13,755.1	Outfall 002 Cumulative Ammonia removed through 3/31/02

Gallons of Water Produced	
604,009,400	Outfall 001 Cumulative water treated through 12/31/01
36,634,900	Outfall 001 Water treated 1st quarter 2002
640,644,300	Outfall 001 Cumulative water treated through 3/31/02
119,704,024	Outfall 002 Cumulative water treated through 12/31/01
6,653,300	Outfall 002 Water treated 1st quarter 2002
126,357,324	Outfall 002 Cumulative water treated through 3/31/02
766,901,624	**TOTAL GROUNDWATER TREATED through 3/31/02**

* Note, the Total flow through FT-14 used for NPDES permit compliance may differ from the summation of individual extraction well totals due to meter inaccuracies
**System average flow is calculated by dividing the total flow by the calendar period
*** Uptime average flow presented is the average flow during operational days
**** the effluent values for Outfall 001 and 002 represent the average ammonia concentrations in mg/l
*****Ammonia mass for 001 in Dec 1999 was calculated by summation of the daily effluent ammonia totals This new method of calculation represents reporting on NPDES reporting forms
Previous totals were calculated using FT-14 flow rate and average daily ammonia concentration.

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
11/21/97						127		44			200		
11/28/97						63.3		40			91		
12/4/97						54.2		55			140		
12/11/97						29.3		51	15		110		
12/18/97	7.21					51.5		44	< 1	< 1	36	< 1	
1/2/98	7.15					35.8		118	16	4	91	1	
1/8/98	6.92					25		86	10	3	84	< 1	
2/5/98	7.46					39.8		69	< 1	< 1	< 1	< 1	
2/12/98	7.19					44.9		62	< 1	< 1	10	< 1	
2/18/98	7.24					31.2		56	< 1	< 1	12	< 1	
2/26/98	7.14					24.6		69	8	2	49	< 1	
3/4/98	7.09					15.9		68	7	2	45	< 1	
3/13/98	6.82					9.95		40	8	2	54	< 1	
3/18/98	7.32					24		63	6	2	45	< 1	
3/27/98	7.27					10.9							
4/1/98	7.14					18.8		68	2	< 1	56	< 1	
4/10/98	7.04					51.6		71	< 1	< 1	45	< 1	
4/15/98	6.97					38.2		86	5	2	61	< 1	M3041622
4/22/98	7.01					20.1		60	< 1	< 1	18	< 1	M3042322
4/30/98	7.18					49		31	< 1	< 1	9	< 1	M3050422
5/7/98	7.22					33.6		42	7	2	41	< 1	M3051222
5/13/98	7.27					29.7		46	6	2	37	< 1	M3051822
5/21/98	7.14					34.4		52	6	2	38	< 1	M3052720
5/29/98	7.02					32.3		54	6	2	37	< 1	M3060122
6/5/98	7.06					34.9		63	7	2	40	< 1	M3060822

Ammonia Data after 2/99 represents Laboratory Composite Results.

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614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
6/11/98	7.08					37.7		32	6	2	40	< 1	M3061222
6/19/98	7.03					39.9		34	8	2	49	< 1	M3062222
6/25/98	7.07					44.3		25	5	< 1	39	< 1	M3063022
7/1/98	7.18					32		54	6	2	46	< 1	M3070622
7/8/98						17.5		31	5	< 1	35	< 1	M3071323
7/13/98						34.7		48	6	< 1	39	< 1	M3071622
7/21/98						40.8		69	6	< 1	41	< 1	M3072322
7/29/98						45.5		71	7	< 1	42	< 1	M3080323
8/4/98	7.65					43.5		21	6	< 1	39	< 1	M3081122
8/10/98	7.76					29.4		19	5	< 1	28	< 1	M3081125
8/18/98	6.53					38		23	6	< 1	30	< 1	M3082521
8/25/98	8.19					57.3		20	6	2	32	< 1	M3082730
9/2/98	9.37					7.39		7	< 1	< 1	7	< 1	584
9/8/98	8.98					4.15		< 1	< 1	< 1	< 1	< 1	623
9/15/98	7.15					12		< 1	< 1	< 1	< 1	< 1	687
9/21/98	7.13					7.95		< 1	< 1	< 1	< 1	< 1	709
9/29/98	7.06					3.54		2	< 1	< 1	< 1	< 1	783
10/5/98	6.9					3.6		34	< 1	< 1	< 1	< 1	797
10/13/98	7.01					9.66		44	6	2	47	< 1	882
10/19/98	7.19					13.7		55	7	2	45	< 1	913
10/29/98	7.06					26.7		55	6	2	44	< 1	974
11/2/98	6.92					39		54	6	2	40	< 1	997
11/9/98	6.86					39.8		61	7	2	51	< 1	1057
11/16/98	6.98					42		61	5	2	33	< 1	1113
11/24/98	7.2					1.91		< 1	< 1	< 1	< 1	< 1	1220

Ammonia Data after 2/99 represents Laboratory Composite Results.

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982 Crupper Avenue
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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
12/1/98	7.11					31.2		56	7	3	47	< 1	1275
12/11/98	6.88					18.5		59	5	1	33	< 1	1386
12/15/98	7.13					39.2		61	5	2	32	< 1	1412
12/22/98	7.11					23		49	4	1	26	< 1	1457
12/29/98	7.33					26.6		53	4	1	34	< 1	1489
1/5/99	7.15					34.7		59	4	1	31	< 1	1523
1/12/99	7.13					24.4		55	7	2	46	< 1	1555
1/19/99	7.42					6		55	2	1	45	< 1	1602
1/27/99	7.1					18.3		69	6	2	53	< 1	1680
2/2/99	7.4							32	6	2	40	< 1	1714
2/11/99	7.09							49	6	2	42	< 1	1826
2/17/99	7.31							49	6	2	42	< 1	1914
2/23/99	7.15							81	11	5	73	< 1	1961
3/2/99	7.35							58	6	2	45	< 1	2107
3/10/99	7.08							62	7	2	49	< 1	2161
3/16/99	7.2							51	6	2	41	< 1	2243
3/23/99	7.47							58	6	2	43	< 1	2301
4/5/99	7.5							56	6	2	44	< 1	2400
4/13/99	7.26							57	6	2	44	< 1	2455
4/20/99	7.31							59	6	2	43	< 1	2516
4/28/99	7.11							58	6	2	45	< 1	2574
5/4/99	7.23							40	11	3	78	1	2600
5/11/99	7.41							60	6	2	43	< 1	2655
5/18/99	7.14							38	6	3	40	< 1	2769
5/25/99	7.16							52	5	3	36	< 1	2852

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
6/1/99	7.09							53	7	3	46	< 1	2938
6/8/99	7.28							47	6	2	39	< 1	2986
6/15/99	6.94							52	5	2	42	< 1	3067
6/22/99	7.23							48	5	2	40	< 1	3128
6/29/99	7.1							56	6	2	46	< 1	3181
7/7/99	7.04				4.94			60	7	2	51	< 1	3224
7/14/99	7.11				4.73			46	6	2	40	< 1	3290
7/20/99	6.98				4.43			47	6	2	43	< 1	3334
7/27/99	7.01				4.42			58	6	2	43	< 1	3379
8/3/99	7.09				4.13			48	6	2	50	< 1	3423
8/10/99	7.28				6.07			33	5	1	35	< 1	3602
8/17/99	7.25				3.73			64	5	2	35	< 1	3759
8/25/99	7.21				2.97			60	5	4	77	< 1	3838
8/31/99	7.28				2.94			55	4	3	63	< 1	3908
9/8/99	7.22				4.84	35.1		46	3	2	46	< 1	3983
9/14/99	7.22				4.56	30		46	4	1	28	< 1	4126
9/21/99	7.07				3.63	23.4		41	3	1	40	< 1	4187
9/28/99	7.13				3.26	21		56	6	2	61	< 1	4274
10/7/99	7.15				3.24			70	12	5	114	1	4345
10/13/99								53	5	2	61	< 1	4382
10/20/99	7.37				4.18			50	2	1	53	< 1	4440
10/26/99	7.45				4.91			< 1	< 1	< 1	< 1	< 1	4501
11/1/99	6.96				3.23			63	7	2	39	< 1	4573
11/10/99	7.39				4.02			55	8	6	64	< 1	4709
11/15/99	7.35				3.87			63	7	4	52	< 1	4768

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

Sample Date	Field Data pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Inorganic Laboratory Analysis Results Ammonia mg/l	Fluoride mg/l	Organic Laboratory Analysis Results VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
11/23/99	7.29				3.33			70	9	5	78	1	4889
12/1/99	7.85				4.94			< 1	< 1	< 1	< 1	< 1	4977
12/7/99	7.34				4.14			59	7	2	47	< 1	5065
12/14/99	7.24				4.43			64	8	2	62	< 1	5138
12/20/99	7.06				3.22			66	8	2	63	< 1	5210
12/27/99	7.34				2.44			68	10	2	78	< 1	5282
1/4/00	6.89				1.74			47	10	2	65	< 1	5340
1/10/00	6.78				2.06			71	8	2	61	< 1	5406
1/18/00	7.11				2.13			77	8	2	63	< 1	5483
1/24/00	7.12				1.69			63	6	2	51	< 1	5538
2/1/00	7.97				2.52			62	6	2	51	< 1	5573
2/9/00	7.56				5.65			79	5	2	52	< 1	5645
2/16/00	7.59				4.75			78	5	1	32	< 1	5754
2/23/00	7.61				4.78			44	5	1	30	< 1	5862
2/29/00	7.62				4.54			47	4	1	34	< 1	5945
3/7/00	7.65				4.63			64	4	2	59	< 1	6007
3/14/00	7.62				4.6			56	4	1	29	< 1	6062
3/17/00								56	4	1	45	< 1	6175
3/22/00	7.4				5.21			56	4	2	55	< 1	6172
3/28/00	7.64				4.4			25	5	1	33	< 1	6227
4/5/00	7.75				4.57			38	2	< 1	38	< 1	6313
4/11/00	7.79				3.37			41	3	< 1	42	< 1	6349
4/18/00	7.66				3.89			43	3	1	31	< 1	6416
4/26/00	7.73				4.52			36	< 1	< 1	< 1	< 1	6480
5/2/00	7.49				2.65			61	4	1	26	< 1	6560

Ammonia Data after 2/99 represents Laboratory Composite Results.

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982 Crupper Avenue
Columbus, Ohio 43229
614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

Sample Date	pH	Field Data: Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Inorganic Laboratory Analysis Results: Ammonia mg/l	Fluoride mg/l	Organic Laboratory Analysis Results: VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
5/9/00	7.7				3.86			34	1	< 1	29	< 1	6643
5/17/00	6.94							43	5	2	39	< 1	6748
5/23/00	7.77				4.1			37	3	1	28	< 1	6808
5/30/00	7.76				4.34			36	2	< 1	20	< 1	6903
6/6/00	7.92				5.12			31	2	1	22	< 1	7007
6/13/00	7.89				3.98			23	2	< 1	20	< 1	7073
6/21/00	7.89				3.33			26	3	1	30	< 1	7158
6/29/00	7.85				3.96			37	4	1	36	< 1	7223
7/5/00	7.57				4.63			28	3	1	31	< 1	7255
7/11/00	7.73				3.61			23	4	2	37	< 1	7311
7/17/00	7.64				3.1			29	3	1	35	< 1	7392
7/26/00	7.72				3.42			22	4	1	38	< 1	7454
8/1/00	7.74				3.48			26	3	< 1	38	< 1	7493
8/8/00	7.83				3.35			41	3	< 1	34	< 1	7541
8/15/00	7.76				4.4			40	3	< 1	35	< 1	7620
8/22/00	7.81				4.25			35	3	< 1	30	< 1	7697
8/29/00	7.65				4.05			44	3	1	38	< 1	7847
9/6/00	7.78				4.44			40	4	3	42	< 1	7931
9/12/00	7.14				3.84			38	3	2	39	< 1	8000
9/21/00	7.79				3.54			27	3	< 1	19	< 1	8104
9/26/00	7.77				3.85			41	3	1	28	< 1	8155
10/4/00	7.79				3.76			42	4	1	31	< 1	8237
10/11/00	7.84				3.52			45	4	1	43	< 1	8279
10/17/00	7.9				2.25			51	4	< 1	28	< 1	8361
10/24/00	7.68				2.06			47	4	1	53	< 1	8455

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
11/1/00	7.9				3.65			52	3	< 1	21	< 1	8550
11/10/00	7.82				4.02			37	4	< 1	25	< 1	8605
11/14/00	7.72				3.8			36	4	1	36	< 1	8613
11/21/00	7.73				3.15			33	4	< 1	21	< 1	8671
11/28/00	7.8				3.22			44	4	2	61	< 1	8681
12/5/00	7.8				2.83			43	3	1	34	< 1	8751
12/13/00	7.8				3.47			41	4	1	37	< 1	8793
12/20/00	7.53				3.64			45	4	1	33	< 1	8858
12/27/00	7.56				4.38			12	4	1	34	< 1	8866
1/4/01	7.8				3.56			13	2	< 1	29	< 1	8887
1/9/01	7.66				3.94			91	4	< 1	19	< 1	8895
1/16/01	7.38				2.68			58	4	2	66	< 1	8927
1/23/01	7.6				3.2			46	5	2	30	< 1	9021
1/31/01	7.84				4.28			41	4	< 1	22	< 1	9085
2/6/01	7.81				2.97			39	3	1	30	< 1	9094
2/13/01	7.77				2.57			46	5	1	26	< 1	9121
2/20/01	7.7				2.95			67	5	2	48	< 1	9201
2/27/01	7.86				3.51			43	4	< 1	25	< 1	9241
3/6/01	7.67				3.8			44	4	1	24	< 1	9262
3/13/01	7.66				4.6			40	4	< 1	24	< 1	9345
3/20/01	7.83				4.73			55	5	1	29	< 1	9374
3/27/01	7.69				3.22			40	5	1	31	< 1	9412
4/3/01	7.69				2.22			34	4	1	50	< 1	9473
4/10/01	7.33				2.8			41	4	2	71	< 1	9517
4/17/01	7.46				3.01			29	4	< 1	24	< 1	9523

Ammonia Data after 2/99 represents Laboratory Composite Results.

Prepared by: **SHARP Technologies, Inc.**
982 Crupper Avenue
Columbus, Ohio 43229
614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
4/24/01	7.78				2.77			28	< 1	2	74	< 1	9616
5/1/01	7.63				2.91			53	< 1	< 1	43	< 1	9643
5/8/01	7.65				3.09			53	< 1	< 1	46	< 1	9669
5/15/01	7.59				1.6			50	4	1	28	< 1	9681
5/22/01	7.78				2.8			40	4	1	30	< 1	9842
5/29/01	7.78				3.06			59	4	1	84	< 1	9865
6/5/01	7.68				2.98			61	4	2	87	< 1	9885
6/13/01	7.68				3.56			47	3	1	73	< 1	10022
6/20/01	7.75				3.22			46	3	1	73	< 1	10040
6/26/01	7.65				2.51			46	3	1	75	< 1	10062
7/5/01	7.64				2.96			35	5	1	38	< 1	10085
7/10/01	7.77				3.75			52	4	1	71	< 1	10099
7/17/01	7.69				2.96			47	4	2	62	< 1	10131
7/24/01	7.71				3.08			47	4	2	72	< 1	10213
7/31/01	7.66				3.24			21	4	< 1	28	< 1	10244
8/7/01	7.79				2.67			43	< 1	< 1	53	< 1	10266
8/15/01	7.71				3.96			50	< 1	2	70	< 1	10287
8/21/01	7.59							66	5	2	57	< 1	10307
8/28/01	7.76							79	6	3	87	< 1	10390
9/5/01	7.78							38	< 1	< 1	< 1	< 1	10416
9/12/01	7.81				3.45			36	4	1	26	< 1	10429
9/18/01	7.8				3.89			26	4	< 1	24	< 1	10467
9/26/01	7.82				3.34			42	< 1	1	29	< 1	10504
10/3/01	7.6				3.9			24	5	1	28	< 1	10526
10/9/01	7.64				3.73			35	4	1	27	< 1	10551

Ammonia Data after 2/99 represents Laboratory Composite Results.

Prepared by: **SHARP Technologies, Inc.**
982 Crupper Avenue
Columbus, Ohio 43229
614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Influent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
10/18/01	7.62				3.86			29	4	< 1	24	< 1	10565
10/25/01	7.45				5.05			21	4	1	38	< 1	10593
10/30/01	7.61				5.38			14	5	1	30	< 1	10656
11/6/01	7.77				4.27			18	4	1	27	< 1	10727
11/13/01	8.31				6.2			< 1	< 1	< 1	< 1	< 1	10772
11/20/01	7.56				3.75			3	< 1	< 1	4	< 1	10788
11/27/01	7.57				4.42			15	5	1	29	< 1	10837
12/3/01	7.75				4.46			50	6	1	34	< 1	10875
12/12/01	7.77				4.07			30	3	< 1	24	< 1	10917
12/18/01	7.79				3.61			31	6	1	53	< 1	10946
12/27/01	7.82				3.28			41	5	1	32	< 1	10975
1/2/02	7.69				3.48			45	5	1	31	< 1	10989
1/8/02	7.79				4.4			29	4	< 1	26	< 1	11003
1/15/02	7.68				3.74			35	3	< 1	21	< 1	11059
1/24/02	5.28				7.69			44	4	< 1	27	< 1	11169
1/29/02	7.63				4.06			39	4	1	23	< 1	11196
2/5/02	7.66				4.15			39	7	1	24	< 1	11272
2/12/02	7.6				3.7			57	5	1	25	< 1	11313
2/20/02	7.56				3.08			51	4	< 1	20	< 1	11342
2/26/02	7.67				3.76			41	3	< 1	20	< 1	11358
3/7/02	7.67				4			35	5	1	24	< 1	11407
3/12/02	7.75				4.35			32	4	1	37	< 1	11427
3/19/02	7.65				3.65			54	5	1	44	< 1	11516
3/26/02	7.69				3.75			38	3	< 1	19	< 1	11547

Ammonia Data after 2/99 represents Laboratory Composite Results.

Prepared by: **SHARP Technologies, Inc.**
982 Crupper Avenue
Columbus, Ohio 43229
614-811-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
11/21/97						134		< 1			< 1		
11/28/97						60.6		< 1			1 5		
12/4/97						60		< 1					
12/11/97						28.7		< 1			2 1		
12/18/97	7.87					56.3		< 1	< 1	3	< 1	< 1	
1/2/98	7.92					34.8		< 1	< 1	< 1	< 1	< 1	
1/8/98	7.8					29.5		< 1	< 1	< 1	< 1	< 1	
2/5/98	7.9					34.6		< 1	< 1	< 1	< 1	< 1	
2/12/98	7.91					53.2		< 1	< 1	< 1	< 1	< 1	
2/18/98	7.67					43.7		< 1	< 1	< 1	< 1	< 1	
2/26/98	7.68					18.8		< 1	< 1	< 1	2	< 1	
3/4/98	7.74					15.4		< 1	< 1	< 1	2	< 1	
3/13/98	7.53					9.7		< 1	< 1	< 1	2	< 1	
3/18/98	7.78					30.1		< 1	< 1	< 1	2	< 1	
3/27/98	7.87					10.4		< 1	< 1	< 1	2	< 1	
4/1/98	7.81					15.4		< 1	< 1	< 1	< 1	< 1	
4/10/98	7.88					60.1		< 1	< 1	< 1	< 1	< 1	
4/15/98	7.75					40.9		< 1	< 1	< 1	1	< 1	M3041620
4/18/98						24							
4/22/98	7.84					18.9		< 1	< 1	< 1	< 1	< 1	M3042320
4/30/98	8.12					52.8		< 1	< 1	< 1	< 1	< 1	M3050420
5/7/98	8.07					33.4		< 1	< 1	< 1	2	< 1	M3051220
5/13/98	8.04					27.6		< 1	< 1	< 1	2	< 1	M3051820
5/21/98	7.92					28.9		< 1	< 1	< 1	2	< 1	M3052721
5/29/98	7.84					28.4		< 1	< 1	< 1	2	< 1	M3060120

Ammonia Data after 2/99 represents Laboratory Composite Results.

Prepared by: **SHARP Technologies, Inc.**
982 Crupper Avenue
Columbus, Ohio 43229
614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

Sample Date	Field Data pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Inorganic Laboratory Analysis Results Ammonia mg/l	Fluoride mg/l	Organic Laboratory Analysis Results VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
6/5/98	7.9 -					35.8		< 1	< 1	< 1	2	< 1	M3061220
6/11/98	7.83					36.5		< 1	< 1	< 1	< 1	< 1	M3061220
6/19/98	7.66					38.4		< 1	< 1	< 1	2	< 1	M3062220
6/25/98	7.72					45.3		< 1	< 1	< 1	2	< 1	M3063020
7/1/98	7.88				5.96	32.2		< 1	< 1	< 1	1	< 1	M3070620
7/8/98	7.79				8.11	37.8		< 1	< 1	< 1	< 1	< 1	M3071320
7/13/98	8.01				7.9	36.8		< 1	< 1	< 1	1	< 1	M3071620
7/21/98	8.06				7.8	49.8		< 1	< 1	< 1	< 1	< 1	M3072320
7/29/98	8.19				7.78	47.7		< 1	< 1	< 1	< 1	< 1	M3080321
8/4/98	8.35				6.33	45.8		< 1	< 1	< 1	< 1	< 1	M3081120
8/5/98	7.42					31.3							M0004444
8/10/98	8.35				4.86	37.6		< 1	< 1	< 1	< 1	< 1	M3081123
8/18/98	8.07				5.96	46.5		< 1	< 1	< 1	< 1	< 1	M3082520
8/25/98	8.62				7.68	52.8		< 1	< 1	< 1	< 1	< 1	M3082728
9/2/98	9.64				9.64	4.07		< 1	< 1	< 1	< 1	< 1	583
9/8/98	10.59				7.86	4.07		< 1	< 1	< 1	< 1	< 1	622
9/15/98	7.16				6.18	3.53		< 1	< 1	< 1	< 1	< 1	686
9/21/98	7.77				6.09	3.56		< 1	< 1	< 1	< 1	< 1	708
9/29/98	7.66				5.2	2.95		< 1	< 1	< 1	< 1	< 1	782
10/5/98	7.28				6.52	4.34		< 1	< 1	< 1	< 1	< 1	796
10/13/98	7.51				6.38	9.44		< 1	< 1	< 1	1	< 1	881
10/19/98	7.38				6.83	12.5		< 1	< 1	< 1	1	< 1	912
10/29/98	7.36				6	26.5		< 1	< 1	< 1	2	< 1	973
11/2/98	7.47				6.06	37.1		< 1	< 1	< 1	2	< 1	996
11/9/98	7.43				6.16	35.3		< 1	< 1	< 1	3	< 1	1056

Ammonia Data after 2/99 represents Laboratory Composite Results.

Prepared by: **SHARP Technologies, Inc.**
982 Crupper Avenue
Columbus, Ohio 43229
614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
11/16/98	7.38				3.84	39.9		< 1	< 1	< 1	< 1	< 1	1112
11/24/98	7.64				4.78	1.85		< 1	< 1	< 1	< 1	< 1	1219
12/1/98	7.55				5.91	30.7		< 1	< 1	< 1	3	< 1	1274
12/11/98	7.78				12.89	25.8		< 1	< 1	< 1	1	< 1	1385
12/15/98	7.47				10.24	38.2		< 1	< 1	< 1	2	< 1	1411
12/22/98	7.54				8.93	21.2		< 1	< 1	< 1	1	< 1	1456
12/29/98	7.68				9.39	17.7		< 1	< 1	< 1	< 1	< 1	1488
1/5/99	7.62				10.74	39.9		< 1	< 1	< 1	1	< 1	1522
1/12/99	7.56				9.41	25.5		< 1	< 1	< 1	3	< 1	1554
1/19/99	7.86				8.62	5.6		< 1	< 1	< 1	< 1	< 1	1601
1/27/99	7.36				10.46	18.9		< 1	< 1	< 1	3	< 1	1679
2/2/99	7.53				12.86	38.5		< 1	< 1	< 1	3	< 1	1713
2/11/99	7.64				9.78	35.8		< 1	< 1	< 1	3	< 1	1825
2/17/99	7.55				8.74	11.3		< 1	< 1	< 1	3	< 1	1913
2/23/99	7.58				9.95	75.2		< 1	< 1	< 1	3	< 1	1958
3/2/99	7.63				9.46	25.4		< 1	< 1	< 1	3	< 1	2106
3/10/99	7.18				9.05	30.2		< 1	< 1	< 1	4	< 1	2160
3/16/99	7.76				9.94	13.1		< 1	< 1	< 1	3	< 1	2242
3/23/99	7.8				9.12	19.4		< 1	< 1	< 1	3	< 1	2300
4/5/99	8.01				8.9	41.3		< 1	< 1	< 1	4	< 1	2399
4/13/99	7.58				8.65	20.3		< 1	< 1	< 1	2	< 1	2454
4/20/99	7.77				9.94	26.6		< 1	< 1	< 1	3	< 1	2515
4/28/99	7.57				10.21	29.8		< 1	< 1	< 1	3	< 1	2573
5/4/99	7.92				8.83	26.1		< 1	< 1	< 1	2	< 1	2599
5/11/99	7.88				8.41	23.5		< 1	< 1	< 1	3	< 1	2654

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

Sample Date	Field Data pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Inorganic Laboratory Analysis Results Ammonia mg/l	Fluoride mg/l	Organic Laboratory Analysis Results VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
5/18/99	7.54				9.35			< 1	< 1	< 1	3	< 1	2768
5/25/99	7.64				9.22	22.4		< 1	< 1	< 1	2	< 1	2851
6/1/99	7.6				9.38	30.3		< 1	< 1	< 1	2	< 1	2937
6/8/99	7.76				9.03	23.8		< 1	< 1	< 1	3	< 1	2985
6/15/99	7.56				10.2			< 1	< 1	< 1	2	< 1	3066
6/22/99	7.38				10.08	23.7		< 1	< 1	< 1	3	< 1	3127
6/29/99	7.51				9.9	25.2		< 1	< 1	< 1	3	< 1	3180
7/7/99	7.55				9.81	24.6		< 1	< 1	< 1	2	< 1	3223
7/14/99	7.64				8.65	26		< 1	< 1	< 1	2	< 1	3289
7/20/99	7.46				8.94			< 1	< 1	< 1	2	< 1	3333
7/27/99	7.52				9.74	42.3		< 1	< 1	< 1	2	< 1	3380
8/3/99	7.63				9.49	35.1		< 1	< 1	< 1	2	< 1	3422
8/10/99	7.5				9.78	24.3		< 1	< 1	< 1	2	< 1	3601
8/17/99	7.56				8.98	26.3		< 1	< 1	< 1	3	< 1	3758
8/25/99	7.6				9.83	27.4		< 1	< 1	< 1	3	< 1	3837
8/31/99	7.83				8.77	30.5		< 1	< 1	< 1	2	< 1	3906
9/8/99	7.58				8.55	29.7		< 1	< 1	< 1	2	< 1	3982
9/14/99	7.38				8.44	35		< 1	< 1	< 1	2	< 1	4125
9/21/99	7.54				8.69	21.1		< 1	< 1	< 1	3	< 1	4186
9/28/99	7.49				8.28	18		< 1	< 1	< 1	3	< 1	4273
10/7/99	7.57				8.51	34.6		< 1	< 1	< 1	3	< 1	4344
10/13/99						34.7		< 1	< 1	< 1	3	< 1	4381
10/20/99	7.84				9.21	14.3		< 1	< 1	< 1	< 1	< 1	4439
10/26/99	7.6				9.07	14.1		< 1	< 1	< 1	< 1	< 1	4500
10/30/99						29.3							4568

Ammonia Data after 2/99 represents Laboratory Composite Results.

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982 Crupper Avenue
Columbus, Ohio 43229
614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
10/31/99						30.8							4569
11/1/99	7.34				9.11	31.5		< 1	< 1	< 1	3	< 1	4572
11/2/99						28							4618
11/3/99						27.6							4619
11/4/99						21.3							4620
11/5/99						26.5							4621
11/6/99						28.2							4665
11/7/99						27.2							4666
11/8/99						36.5							4700
11/9/99						35.8							4701
11/10/99	7.91				8.12	24		< 1	< 1	< 1	3	< 1	4708
11/11/99						24.7							4769
11/12/99						28.2							4770
11/13/99						27.8							4771
11/14/99						28.1							4772
11/15/99	7.73				9.15	26.6		< 1	< 1	< 1	2	< 1	4767
11/16/99						36.2							4891
11/23/99	7.63				8.17	40.4		< 1	< 1	< 1	2	< 1	4888
12/1/99	7.91				8.73	30.2		< 1	< 1	< 1	< 1	< 1	4976
12/6/99						58.4							5062
12/7/99	7.63				8.85	34.6		< 1	< 1	< 1	2	< 1	5064
12/7/99						25.9							5129
12/8/99						31.7							5130
12/9/99						31.2							5131
12/10/99						30.9							5132

Ammonia Data after 2/99 represents Laboratory Composite Results.

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614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
12/11/99						30.2							5133
12/12/99						29.4							5134
12/13/99						25.5							5135
12/14/99	7.63				9.15	30.7		< 1	< 1	< 1	3	< 1	5137
12/15/99						27.1							5213
12/20/99	7.3				9.07	29.4		< 1	< 1	< 1	3	< 1	5209
12/27/99	7.89				9.01	21.2		< 1	< 1	< 1	3	< 1	5281
1/4/00	7.06				9.33	13.9		< 1	< 1	< 1	2	< 1	5339
1/10/00	7.61				8.72	33.8		< 1	< 1	< 1	3	< 1	5405
1/18/00	7.34				8.9	27.9		< 1	< 1	< 1	2	< 1	5482
1/24/00	7.22				9.38			< 1	< 1	< 1	3	< 1	5537
2/1/00	8.19				8.66	38.1		< 1	< 1	< 1	3	< 1	5572
2/9/00	7.67				9.85	18.3		< 1	< 1	< 1	5	< 1	5644
2/16/00	7.61				9.05	30		< 1	< 1	< 1	4	< 1	5753
2/23/00	7.57				8.09	29.5		< 1	< 1	< 1	5	< 1	5861
2/29/00	7.65				8.67	37.4		< 1	< 1	< 1	5	< 1	5944
3/7/00	7.64				9.33	31		< 1	< 1	< 1	6	< 1	6006
3/14/00	7.68				9.14	29.9		< 1	< 1	< 1	6	< 1	6061
3/17/00								< 1	< 1	< 1	3	< 1	6176
3/22/00	7.44				9.42	32.3		< 1	< 1	< 1	3	< 1	6173
3/28/00	7.71				9.53	29.8		< 1	< 1	< 1	1	< 1	6226
4/5/00	7.81				9.64	15.3		< 1	< 1	< 1	4	< 1	6312
4/11/00	8.05				9.27	19.5		< 1	< 1	< 1	3	< 1	6348
4/18/00	7.71				9.21	34.5		< 1	< 1	< 1	3	< 1	6415
4/26/00	7.83				9.52	34.9		< 1	< 1	< 1	< 1	< 1	6479

Ammonia Data after 2/99 represents Laboratory Composite Results.

Prepared by **SHARP Technologies, Inc.**
982 Crupper Avenue
Columbus, Ohio 43229
614-841-4650

Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

Sample Date	Field Data pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Inorganic Laboratory Analysis Results Ammonia mg/l	Fluoride mg/l	Organic Laboratory Analysis Results VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
5/2/00	7.75				9.84	13		< 1	< 1	< 1	4	< 1	6559
5/9/00	7.79				9.08	27.1		< 1	< 1	< 1	3	< 1	6642
5/17/00	7.8					28.4		< 1	< 1	< 1	3	< 1	6747
5/23/00	7.91				8.9	31.5		< 1	< 1	< 1	2	< 1	6807
5/30/00	7.84				8.73	31.5		< 1	< 1	< 1	2	< 1	6902
6/6/00	8.12				8.83	26.8		< 1	< 1	< 1	3	< 1	7006
6/13/00	7.94				9.45			< 1	< 1	< 1	3	< 1	7072
6/21/00	8.05				8.78	33.4		< 1	< 1	< 1	3	< 1	7157
6/29/00	7.92				8.72	30.8		< 1	< 1	< 1	3	< 1	7222
7/5/00	7.65				8.83	26.6		< 1	< 1	< 1	2	< 1	7254
7/11/00	7.81				9.06	23.2		< 1	< 1	< 1	2	< 1	7310
7/17/00	7.85				8.81	30.8		< 1	< 1	< 1	< 1	< 1	7391
7/26/00	7.89				8.91	26.5		< 1	< 1	< 1	2	< 1	7453
8/1/00	7.91				8.9	23		< 1	< 1	< 1	4	< 1	7492
8/8/00	7.89				8.76	30.7		< 1	< 1	< 1	4	< 1	7540
8/15/00	7.83				8.83			< 1	< 1	< 1	4	< 1	7619
8/22/00	7.92				9.09	27.1		< 1	< 1	< 1	4	< 1	7696
8/29/00	7.8				9.27	29.1		< 1	< 1	< 1	3	< 1	7846
9/6/00	7.92				9.18			< 1	< 1	< 1	6	< 1	7930
9/12/00	7.84				9.03	30.4		< 1	< 1	< 1	5	< 1	7999
9/21/00	7.82				8.94	22.4		< 1	< 1	< 1	4	< 1	8103
9/26/00	7.89				8.84	27.1		< 1	< 1	< 1	4	< 1	8154
10/4/00	8.03				8.66	31.4		< 1	< 1	< 1	3	< 1	8236
10/11/00	7.86				8.66	15.3		< 1	< 1	< 1	3	< 1	8278
10/17/00	8.11				9.16	31.4		< 1	< 1	< 1	3	< 1	8360

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
10/24/00	7.78				9.56	33.1		< 1	< 1	< 1	3	< 1	8454
11/1/00	8.07				8.56	20.8		< 1	< 1	< 1	3	< 1	8549
11/10/00	8.09				8.79	27.8		< 1	< 1	< 1	2	< 1	8604
11/14/00	7.87				8.97	19.5		< 1	< 1	< 1	3	< 1	8612
11/21/00	7.82				9.17	21.7		< 1	< 1	< 1	3	< 1	8672
11/28/00	7.92				7.99	22.7		< 1	< 1	< 1	5	< 1	8680
12/5/00	7.94				8.95	24.9		< 1	< 1	< 1	3	< 1	8750
12/13/00	7.99				9.22	26.1		< 1	< 1	< 1	4	< 1	8794
12/20/00	7.6				9.36	23.3		< 1	< 1	< 1	3	< 1	8857
12/27/00	7.6				9.56	30.5		< 1	< 1	< 1	3	< 1	8865
1/4/01	7.86				9.01	31.2		< 1	< 1	< 1	3	< 1	8886
1/9/01	7.86				8.96	6.56		< 1	< 1	< 1	2	< 1	8894
1/16/01	7.58				9.13	22.3		< 1	< 1	< 1	2	< 1	8926
1/23/01	7.73				9.08	27.3		< 1	< 1	< 1	6	< 1	9020
1/31/01	8.05				9.2	51.5		< 1	< 1	< 1	2	< 1	9084
2/3/01						19.2							9089
2/4/01						23.5							9090
2/5/01						25.9							9091
2/6/01	8.03				9.21	23.9		< 1	< 1	< 1	2	< 1	9093
2/7/01						23.6							9118
2/13/01	8.08				9.1	22		< 1	< 1	< 1	2	< 1	9120
2/20/01	8.09				9.21	24.2		< 1	< 1	< 1	1	< 1	9200
2/27/01	8.11				9.15	23.3		< 1	< 1	< 1	3	< 1	9240
3/5/01						25.3							9259
3/6/01	7.9				9.06	21.4		< 1	< 1	< 1	3	< 1	9261

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
3/8/01						19.7							9341
3/13/01	8.01				8.89	20.4		< 1	< 1	< 1	3	< 1	9344
3/20/01						24		< 1	< 1	< 1	2	< 1	9371
3/20/01	8.16				9.09	23.8		< 1	< 1	< 1	6	< 1	9373
3/27/01	7.86				8.83	26.5		< 1	< 1	< 1	2	< 1	9411
4/3/01	7.86				8.83	23		< 1	< 1	< 1	2	< 1	9472
4/10/01	8.17				8.56	27.4		< 1	< 1	< 1	< 1	< 1	9516
4/17/01	7.83				8.6	25.8		< 1	< 1	< 1	2	< 1	9522
4/24/01	8.18				9.38	20.4		< 1	< 1	< 1	< 1	< 1	9615
5/1/01	8.11				8.96	20.9		< 1	< 1	< 1	< 1	< 1	9642
5/8/01	8.12				8.93	26.5		< 1	< 1	< 1	< 1	< 1	9668
5/15/01	7.99				8.91	29.8		< 1	< 1	< 1	1	< 1	9680
5/22/01	7.96				8.66	25.4		< 1	< 1	< 1	5	< 1	9841
5/29/01	8.21				8.83	28.3		< 1	< 1	< 1	1	< 1	9864
6/5/01	7.94				8.62	27.5		< 1	< 1	< 1	1	< 1	9884
6/13/01	8.06				8.94			< 1	< 1	< 1	5	< 1	10021
6/20/01	8.02				8.71	30		< 1	< 1	< 1	5	< 1	10039
6/26/01	8				8.41	19.1		< 1	< 1	< 1	5	< 1	10061
7/5/01	8.48				8.08	22.4		< 1	< 1	< 1	7	< 1	10084
7/10/01	8.33				8.8	23.8		< 1	< 1	< 1	4	< 1	10098
7/17/01	8.22				8.85	22.7		< 1	< 1	< 1	8	< 1	10130
7/24/01	8.18				8.41	21		< 1	< 1	< 1	6	< 1	10212
7/31/01	8.14				8.53	21.4		< 1	< 1	< 1	8	< 1	10243
8/7/01	8.16				8.23			< 1	< 1	< 1	3	< 1	10265
8/15/01	8.15				8.27	13.7		< 1	< 1	< 1	< 1	< 1	10286

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
8/21/01	7.93					25.7		< 1	< 1	< 1	8	< 1	10306
8/28/01	8.2					31.7		< 1	< 1	< 1	7	< 1	10389
9/5/01	8.17					20.4		< 1	< 1	< 1	< 1	< 1	10415
9/12/01	8.16				8.32	20.7		< 1	< 1	< 1	< 1	< 1	10428
9/18/01	8.18				8.78	18.7		< 1	< 1	< 1	< 1	< 1	10466
9/26/01	8.17				8.83	20		< 1	< 1	< 1	< 1	< 1	10503
10/3/01	8.16				8.74	22.7		< 1	< 1	< 1	< 1	< 1	10525
10/9/01	8.22				8.81	23.5		< 1	< 1	< 1	< 1	< 1	10550
10/18/01	8.08				8.75	23.7		< 1	< 1	< 1	< 1	< 1	10564
10/25/01	7.87				8.73	22.2		< 1	< 1	< 1	2	< 1	10592
10/30/01	8.13				8.61	16.3		< 1	< 1	< 1	3	< 1	10657
11/6/01	8.04				8.34	22.8		< 1	< 1	< 1	3	< 1	10726
11/13/01	8.32				8.34	18.3		< 1	< 1	< 1	< 1	< 1	10771
11/20/01	7.81				8.01	18.6		< 1	< 1	< 1	3	< 1	10787
11/27/01	8.38				8.52	17.9		< 1	< 1	< 1	3	< 1	10838
11/30/01						31.7							10869
12/1/01						30.4							10870
12/2/01						33							10871
12/3/01	8.29				8.71	32.1		< 1	< 1	< 1	2	< 1	10874
12/12/01	8.34				8.53	24.8		< 1	< 1	< 1	3	< 1	10916
12/18/01	8.3				8.79	31.1		< 1	< 1	< 1	< 1	< 1	10945
12/27/01	8.32				8.68	36.7		< 1	< 1	< 1	< 1	< 1	10974
12/31/01						30.6							10986
1/2/02	8.18				8.56	30.6		< 1	< 1	< 1	2	< 1	10988
1/8/02	8.33				8.61	32		< 1	< 1	< 1	1	< 1	11002

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 4

Motor Wheel Disposal Site

Water Quality Records for: Outfall 1 Effluent

(Air Stripper)

	Field Data				Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
1/15/02	8.27				8.69	30.9		< 1	< 1	< 1	2	< 1	11058
1/24/02	8.26				8.63	21		< 1	< 1	< 1	3	< 1	11168
1/29/02	8.33				8.64	20.6		< 1	< 1	< 1	3	< 1	11195
2/5/02	8.34				8.35	21.6		< 1	< 1	< 1	2	< 1	11271
2/12/02	8.29				8.66	22.3		< 1	< 1	< 1	2	< 1	11312
2/20/02	8.31				8.89	21		< 1	< 1	< 1	2	< 1	11341
2/21/02						17.5							11355
2/26/02	8.14				8.35	20.2		< 1	< 1	< 1	2	< 1	11357
3/7/02	8.05				8.72	19.9		< 1	< 1	< 1	2	< 1	11406
3/12/02	8.11				8.7	21 9		< 1	< 1	< 1	2	< 1	11426
3/19/02	8.24				8.54	24.2		< 1	< 1	< 1	3	< 1	11515
3/20/02						24.7							11543
3/26/02	8.38				8.81	23.5		< 1	< 1	< 1	2	< 1	11546

Ammonia Data after 2/99 represents Laboratory Composite Results.

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Table 5

Motor Wheel Disposal Site

Water Quality Records for: Outfall 2 Effluent

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
11/21/97	7.5					29.5		< 1			< 1		
11/28/97								< 1			< 1		
12/4/97	7.3					21.6		< 1			< 1		
12/11/97	7.4					30.3		< 1			< 1		
12/18/97	7.48					19.4		< 1	< 1	< 1	< 1	< 1	
1/2/98	7.69					19.4		< 1	< 1	< 1	< 1	< 1	
1/8/98	7.44					18.6		< 1	< 1	< 1	< 1	< 1	
1/16/98	7.62					20.8		< 1	< 1	< 1	< 1	< 1	
1/21/98	7.23					18.1		< 1	< 1	< 1	< 1	< 1	
2/26/98	7.23					16.2		< 1	< 1	< 1	< 1	< 1	
3/4/98	7.26					9.96		< 1	< 1	< 1	< 1	< 1	
3/13/98	7.18					4.64		< 1	< 1	< 1	< 1	< 1	
3/18/98	7.38					16.8		< 1	< 1	< 1	< 1	< 1	
3/27/98	7.45					3.82		< 1	< 1	< 1	< 1	< 1	
4/1/98	7.42					31.9		< 1	< 1	< 1	< 1	< 1	
4/10/98	7.38					16.7		< 1	< 1	< 1	< 1	< 1	
4/15/98	7.21					18.3		< 1	< 1	< 1	< 1	< 1	M3041621
4/22/98	7.34					11.3		< 1	< 1	< 1	< 1	< 1	M3042321

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Table 5

Motor Wheel Disposal Site

Water Quality Records for: Outfall 2 Effluent

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
4/30/98	7.47					14.8		< 1	< 1	< 1	< 1	< 1	M3050421
5/7/98	7.46					16.4		< 1	< 1	< 1	< 1	< 1	M3051221
5/13/98	7.5					15.9		< 1	< 1	< 1	< 1	< 1	M3051821
5/21/98	7.34					18.2		< 1	< 1	< 1	< 1	< 1	M3052722
5/29/98	7.21					16.3		< 1	< 1	< 1	< 1	< 1	M3060121
6/5/98	7.27					12.4		< 1	< 1	< 1	< 1	< 1	M3060821
6/11/98	7.24					15.1		< 1	< 1	< 1	< 1	< 1	M3061221
6/19/98	7.13					16.2		< 1	< 1	< 1	< 1	< 1	M3062221
6/25/98	7.22					16.4		< 1	< 1	< 1	< 1	< 1	M3063021
7/1/98	7.44				8.01	17		< 1	< 1	< 1	< 1	< 1	M3070621
7/8/98	7.33				7.65	14		< 1	< 1	< 1	< 1	< 1	M3071322
7/13/98	7.51				8.19	17		< 1	< 1	< 1	< 1	< 1	M3071621
7/21/98	7.52				8.83	15.3		< 1	< 1	< 1	< 1	< 1	M3072321
7/29/98	7.78				9.03	16		< 1	< 1	< 1	< 1	< 1	M3080322
8/4/98	7.72				8.12	12.4		< 1	< 1	< 1	< 1	< 1	M3081121
8/10/98	7.69				8.2	15.5		< 1	< 1	< 1	< 1	< 1	M3081124
8/18/98	8.71				8.32	17.9		< 1	< 1	< 1	< 1	< 1	M3082522
8/25/98	8.21				8.66	23.1		< 1	< 1	< 1	< 1	< 1	M3082729

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Table 5

Motor Wheel Disposal Site

Water Quality Records for: Outfall 2 Effluent

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
9/2/98	9.54				8.65	15.44		< 1	< 1	< 1	< 1	< 1	585
9/8/98	10.27				8.02	14.9		< 1	< 1	< 1	< 1	< 1	624
9/15/98	6.8				7.7	16.7		< 1	< 1	< 1	< 1	< 1	688
9/21/98	6.95				8.04	16.4		< 1	< 1	< 1	< 1	< 1	710
9/29/98	6.91				7.74	15.1		< 1	< 1	< 1	< 1	< 1	784
10/5/98	7.1				8.25	15.7		< 1	< 1	< 1	< 1	< 1	798
10/13/98	6.95				7.85	14.3		< 1	< 1	< 1	< 1	< 1	883
10/19/98	7.15				8.25	18.2		< 1	< 1	< 1	< 1	< 1	914
10/29/98	7.04				8.53	10.8		< 1	< 1	< 1	< 1	< 1	975
11/2/98	7.19				8.76	17.9		< 1	< 1	< 1	< 1	< 1	998
11/9/98	7.06				8.41	17.1		< 1	< 1	< 1	< 1	< 1	1058
11/16/98	7.1				4.43	18.1		< 1	< 1	< 1	< 1	< 1	1114
11/23/98	7.2				5.73	8.91		< 1	< 1	< 1	< 1	< 1	1221
12/1/98	7.12				5.35	14		< 1	< 1	< 1	< 1	< 1	1276
12/8/98	7.34				9.29	13.4		< 1	< 1	< 1	< 1	< 1	1387
12/14/98	7.26				9.68	14.8		< 1	< 1	< 1	< 1	< 1	1410
12/22/98	7.29				8.86	11.8		< 1	< 1	< 1	< 1	< 1	1455
12/29/98	7.2				9.24	13.8		< 1	< 1	< 1	< 1	< 1	1490

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Table 5

Motor Wheel Disposal Site

Water Quality Records for: Outfall 2 Effluent

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
1/5/99	7.23				9.18	16.3		< 1	< 1	< 1	< 1	< 1	1524
1/12/99	7.14				9.07	12.1		< 1	< 1	< 1	< 1	< 1	1556
1/19/99	7.19				8.41	19.1		< 1	< 1	< 1	< 1	< 1	1603
1/27/99	7.14				9.72	15.6		< 1	< 1	< 1	< 1	< 1	1681
2/2/99	7.23				12.03	14.1		< 1	< 1	< 1	< 1	< 1	1715
2/11/99	7.23				9.33	7.75		< 1	< 1	< 1	< 1	< 1	1827
2/17/99	7.3				8.44	9.45		< 1	< 1	< 1	< 1	< 1	1915
2/23/99	7.2				9.07	20.8		< 1	< 1	< 1	< 1	< 1	1957
3/2/99	7.47				8.82	10.2		< 1	< 1	< 1	< 1	< 1	2105
3/10/99	7.37				8.49	14.5		< 1	< 1	< 1	< 1	< 1	2162
3/16/99	6.86				8.76	7.36		< 1	< 1	< 1	< 1	< 1	2244
3/23/99	7.35				8.47	8.39		< 1	< 1	< 1	< 1	< 1	2302
3/30/99	7.55				8.55	8.35		< 1	< 1	< 1	< 1	< 1	2367
4/5/99	7.58				8.65	13.3		< 1	< 1	< 1	< 1	< 1	2401
4/13/99	7.46				8.81	10.5		< 1	< 1	< 1	< 1	< 1	2456
4/20/99	7.48				8.66	10.6		< 1	< 1	< 1	< 1	< 1	2517
4/28/99	7.52				8.57	8.04		< 1	< 1	< 1	< 1	< 1	2572
5/4/99	7.68				9.43	13.4		< 1	< 1	< 1	< 1	< 1	2601

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Water Quality Records for: Outfall 2 Effluent

Sample Date	pH	Field Data: Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Inorganic Laboratory Analysis Results: Ammonia mg/l	Fluoride mg/l	Organic Laboratory Analysis Results: VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
5/11/99	8.22				8.63	12		< 1	< 1	< 1	< 1	< 1	2656
5/18/99	7.13				8.59	11.2		< 1	< 1	< 1	< 1	< 1	2770
5/25/99	7.35				8.64	9.59		< 1	< 1	< 1	< 1	< 1	2853
6/1/99	7.17				8.56	12.1		< 1	< 1	< 1	< 1	< 1	2936
6/8/99	7.46				8.13	11.1		< 1	< 1	< 1	< 1	< 1	2987
6/15/99	7.29				9.46	11.3		< 1	< 1	< 1	< 1	< 1	3068
6/22/99	7.27				8.94	13.1		< 1	< 1	< 1	< 1	< 1	3129
6/29/99	7.43				8.9	11.1		< 1	< 1	< 1	< 1	< 1	3182
7/7/99	7.47				8.57	9.7		< 1	< 1	< 1	< 1	< 1	3222
7/14/99	7.4				8.28	13		< 1	< 1	< 1	< 1	< 1	3288
7/20/99	7.36				8.88	11.6		< 1	< 1	< 1	< 1	< 1	3332
7/27/99	7.22				9.15	13.4		< 1	< 1	< 1	< 1	< 1	3378
8/3/99	7.18				8.97	15.1		< 1	< 1	< 1	< 1	< 1	3421
8/10/99	7.46				9.03	12.8		< 1	< 1	< 1	< 1	< 1	3600
8/17/99	7.43				8.43	10.9		< 1	< 1	< 1	< 1	< 1	3757
8/25/99	7.37				8.97	12.8		< 1	< 1	< 1	< 1	< 1	3836
8/31/99	7.4				9.22	13.4		< 1	< 1	< 1	< 1	< 1	3909
9/8/99	7.39				8.78	13.9		< 1	< 1	< 1	< 1	< 1	3981

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Motor Wheel Disposal Site

Water Quality Records for: Outfall 2 Effluent

		Field Data				Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC µg/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
9/14/99	7.49				8.49	17.3		< 1	< 1	< 1	< 1	< 1	4127
9/21/99	7.36				8.99	6.8		< 1	< 1	< 1	< 1	< 1	4183
9/28/99	7.42				8.69	11		< 1	< 1	< 1	< 1	< 1	4272
10/7/99	7.53				8.64	13.4		< 1	< 1	< 1	< 1	< 1	4343
10/13/99	7.53				9.12	13.3		< 1	< 1	< 1	< 1	< 1	4380
10/19/99	7.39				8.96	14.7		< 1	< 1	< 1	< 1	< 1	4441
10/26/99	7.5				9.33	11.7		< 1	< 1	< 1	< 1	< 1	4502
11/1/99	7.39				9.11	13.1		< 1	< 1	< 1	< 1	< 1	4571
11/10/99	7.85				9.06	12.4		< 1	< 1	< 1	< 1	< 1	4707
11/15/99	7.37				9.17	11.1		< 1	< 1	< 1	< 1	< 1	4766
11/23/99	7.55				8.81	15		< 1	< 1	< 1	< 1	< 1	4890
12/1/99	7.53				8.67	15.1		< 1	< 1	< 1	< 1	< 1	4975
12/7/99	7.15				8.68	15 8		< 1	< 1	< 1	< 1	< 1	5063
12/14/99	7.65				9.32	9.2		< 1	< 1	< 1	< 1	< 1	5136
12/20/99	7.68				9.3	14.1		< 1	< 1	< 1	< 1	< 1	5211
12/27/99	7.44				9	9.77		< 1	< 1	< 1	< 1	< 1	5280
1/4/00	7.67				9.06	10.5		< 1	< 1	< 1	< 1	< 1	5338
1/10/00	7.03				9.57	9.41		< 1	< 1	< 1	< 1	< 1	5404

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Motor Wheel Disposal Site

Water Quality Records for: Outfall 2 Effluent

Sample Date	pH	Field Data: Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Inorganic Laboratory Analysis Results: Ammonia mg/l	Fluoride mg/l	Organic Laboratory Analysis Results: VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
1/18/00	7.66				9.16	12.9		< 1	< 1	< 1	< 1	< 1	5481
1/24/00	7.2				9.25	14.3		< 1	< 1	< 1	< 1	< 1	5536
2/1/00	7.71				9.69	14.6		< 1	< 1	< 1	< 1	< 1	5574
2/9/00	7.64				8.94	7.75		< 1	< 1	< 1	< 1	< 1	5643
2/16/00	7.78				9.52	11.9		< 1	< 1	< 1	< 1	< 1	5752
2/23/00	7.68				8.83	11.7		< 1	< 1	< 1	< 1	< 1	5860
2/29/00	7.68				9.3	15.6		< 1	< 1	< 1	< 1	< 1	5940
3/7/00	7.71				9.34	15.3		< 1	< 1	< 1	< 1	< 1	6005
3/14/00	7.85				9.09	14.8		< 1	< 1	< 1	< 1	< 1	6060
3/22/00	7.73				8.61	11.1		< 1	< 1	< 1	< 1	< 1	6174
3/28/00	7.69				9.41	11.1		< 1	< 1	< 1	< 1	< 1	6225
4/5/00	7.78				9	12.7		< 1	< 1	< 1	< 1	< 1	6311
4/11/00	7.75				9.03	15.6		< 1	< 1	< 1	< 1	< 1	6347
4/18/00	7.73				9.01	18.8		< 1	< 1	< 1	< 1	< 1	6417
4/26/00	7.82				8.62	15.6		< 1	< 1	< 1	< 1	< 1	6478
5/2/00	7.81				8.34	14		< 1	< 1	< 1	< 1	< 1	6558
5/9/00	7.7				8.54	18		< 1	< 1	< 1	< 1	< 1	6641
5/17/00	7.01					16		< 1	< 1	< 1	< 1	< 1	6746

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Motor Wheel Disposal Site

Water Quality Records for: Outfall 2 Effluent

	Field Data				Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
5/23/00	7.75				8.42	14.2		< 1	< 1	< 1	< 1	< 1	6806
5/30/00	7.76				8.26	14.8		< 1	< 1	< 1	< 1	< 1	6901
6/6/00	7.85				8.54	11.9		< 1	< 1	< 1	< 1	< 1	7005
6/13/00	7.85				9.17	13.2		< 1	< 1	< 1	< 1	< 1	7071
6/21/00	7.8				8.49	10.2		< 1	< 1	< 1	< 1	< 1	7156
6/29/00	7.94				8.27	14.4		< 1	< 1	< 1	< 1	< 1	7221
7/5/00	7.23				8.44	13.1		< 1	< 1	< 1	< 1	< 1	7253
7/11/00	7.78				8.99	10.5		< 1	< 1	< 1	< 1	< 1	7309
7/17/00	7.75				8.65	12.5		< 1	< 1	< 1	< 1	< 1	7390
7/25/00	7.76				8.35	12.3		< 1	< 1	< 1	< 1	< 1	7452
8/1/00	7.79				9.31	10.9		< 1	< 1	< 1	< 1	< 1	7491
8/8/00	7.8				8.69	12.8		< 1	< 1	< 1	< 1		7539
8/15/00	7.8				8.78	12.9		< 1	< 1	< 1	< 1		7618
8/22/00	7.83				8.67	12.5		< 1	< 1	< 1	< 1	< 1	7695
8/29/00	7.57				8.94	12.5		< 1	< 1	< 1	< 1	< 1	7845
9/6/00	7.81				9.05	12.4		< 1	< 1	< 1	< 1	< 1	7929
9/12/00	8.08				8.6	11.3		< 1	< 1	< 1	< 1	< 1	7998
9/21/00	7.92				8.21	11.5		< 1	< 1	< 1	< 1	< 1	8102

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Water Quality Records for: Outfall 2 Effluent

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
9/26/00	7.93				8.16	2.18		< 1	< 1	< 1	< 1	< 1	8153
10/4/00	7.99				7.8	10.3		< 1	< 1	< 1	< 1	< 1	8235
10/11/00	7.96				8.83	9.92		< 1	< 1	< 1	< 1	< 1	8277
11/21/00	7.85				9.01	11.4		< 1	< 1	< 1	< 1	< 1	8670
11/28/00	7.89				7.42	12.3		< 1	< 1	< 1	< 1	< 1	8679
12/5/00	6.86				8.74	11.8		< 1	< 1	< 1	< 1	< 1	8749
12/13/00	7.92				8.37	11.5		< 1	< 1	< 1	< 1	< 1	8795
12/20/00	7.75				9.1	10.5		< 1	< 1	< 1	< 1	< 1	8856
12/27/00	7.82				9.11	12.8		< 1	< 1	< 1	< 1	< 1	8864
1/4/01	7.7				8.53	12.4		< 1	< 1	< 1	< 1	< 1	8885
1/9/01	7.77				9.24	11.4		< 1	< 1	< 1	< 1	< 1	8893
1/16/01	7.04				8.93	10.9		< 1	< 1	< 1	< 1	< 1	8925
1/23/01	7.62				8.24	12.2		< 1	< 1	< 1	< 1	< 1	9019
2/13/01	7.87				9.92	5.05		< 1	< 1	< 1	< 1	< 1	9122
2/20/01	7.85				8.84	10.7		< 1	< 1	< 1	< 1	< 1	9199
2/27/01	7.93				9.82	11.4		< 1	< 1	< 1	< 1	< 1	9239
3/6/01	7.85				9.1	11.7		< 1	< 1	< 1	< 1	< 1	9260
3/13/01	7.62				8.87	9.65		< 1	< 1	< 1	< 1	< 1	9343

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Water Quality Records for: Outfall 2 Effluent

	Field Data				Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
3/20/01	7.8				8.73	11.3		< 1	< 1	< 1	< 1	< 1	9375
3/27/01	7.77				8.21	10.8		< 1	< 1	< 1	< 1	< 1	9410
4/3/01	7.77				8.21	11.4		< 1	< 1	< 1	< 1	< 1	9471
4/10/01	7.65				8.84	12.4		< 1	< 1	< 1	< 1	< 1	9515
4/17/01	7.75				8.22	13		< 1	< 1	< 1	< 1	< 1	9521
4/24/01	7.76				8.55	9.64		< 1	< 1	< 1	< 1	< 1	9617
5/1/01	7.71				7.97	12.6		< 1	< 1	< 1	< 1	< 1	9641
5/8/01	7.69				8.1	12		< 1	< 1	< 1	< 1	< 1	9667
5/15/01	7.62				8.67	13		< 1	< 1	< 1	< 1	< 1	9679
5/22/01	7.8				8.24	9.68		< 1	< 1	< 1	< 1	< 1	9840
5/29/01	7.61				8.3	10.8		< 1	< 1	< 1	< 1	< 1	9863
6/5/01	7.68				8.23	11.2		< 1	< 1	< 1	< 1	< 1	9883
6/13/01	7.64				8	9.99		< 1	< 1	< 1	< 1	< 1	10020
6/20/01	7.66				8.59	10.1		< 1	< 1	< 1	< 1	< 1	10038
6/26/01	7.58				7.13	9.1		< 1	< 1	< 1	< 1	< 1	10060
7/5/01	7.7				8.43	9.28		< 1	< 1	< 1	< 1	< 1	10083
7/10/01	7.57				7.5	9.92		< 1	< 1	< 1	< 1	< 1	10097
7/17/01	7.55				7.5	8.84		< 1	< 1	< 1	< 1	< 1	10129

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	Field Data				Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
7/24/01	7.58				7.06	9.29		< 1	< 1	< 1	< 1	< 1	10211
7/31/01	7.56				7.23	9.35		< 1	< 1	< 1	< 1	< 1	10242
8/7/01	7.65				7.09	10.8		< 1	< 1	< 1	< 1	< 1	10264
8/15/01	7.59				7.57	8.65		< 1	< 1	< 1	< 1	< 1	10285
8/21/01	7.63				7.41	10.4		< 1	< 1	< 1	< 1	< 1	10305
8/28/01	7.56					10.4		< 1	< 1	< 1	< 1	< 1	10388
9/5/01	7.57					10.8		< 1	< 1	< 1	< 1	< 1	10414
9/12/01	7.77				7.18	9.39		< 1	< 1	< 1	< 1	< 1	10427
9/18/01	7.51				8.35	9.05		< 1	< 1	< 1	< 1	< 1	10465
9/26/01	7.49				8.28	8.32		< 1	< 1	< 1	< 1	< 1	10502
10/3/01	7.53				8.38	10.1		< 1	< 1	< 1	< 1	< 1	10524
10/9/01	7.67				7.37	7.34		< 1	< 1	< 1	< 1	< 1	10552
10/25/01	7.6				8.43	11		< 1	< 1	< 1	< 1	< 1	10591
10/30/01	7.59				7.81	5.75		< 1	< 1	< 1	< 1	< 1	10655
11/6/01	7.66				7.12	9.93		< 1	< 1	< 1	< 1	< 1	10725
11/13/01	7.65				7.97	9.96		< 1	< 1	< 1	< 1	< 1	10770
11/20/01	7.43				7.1	7.79		< 1	< 1	< 1	< 1	< 1	10786
11/27/01	7.46				7.51	8.84		< 1	< 1	< 1	< 1	< 1	10836

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Water Quality Records for: Outfall 2 Effluent

	Field Data					Inorganic Laboratory Analysis Results		Organic Laboratory Analysis Results					
Sample Date	pH	Temp F	Cond uS/cm	SP COND mS/cm	DO mg/l	Ammonia mg/l	Fluoride mg/l	VC ug/l	TCE µg/l	T12DCE µg/l	C-1,2-DCE µg/l	1,1-DCE µg/l	Lab Report Number
12/3/01	7.46				8.03	9		< 1	< 1	< 1	< 1	< 1	10873
12/12/01	7.49				7.8	8.55		< 1	< 1	< 1	< 1	< 1	10915
12/18/01	7.48				7.65	10.4		< 1	< 1	< 1	< 1	< 1	10944
12/27/01	7.58				7.8	7.68		< 1	< 1	< 1	< 1	< 1	10973
1/2/02	7.54				7.99	11.6		< 1	< 1	< 1	< 1	< 1	10987
1/8/02	7.59				8.05	8.23		< 1	< 1	< 1	< 1	< 1	11001
1/15/02	7.57				8.55	9.77		< 1	< 1	< 1	< 1	< 1	11057
1/24/02	7.49				8.4	9.51		< 1	< 1	< 1	< 1	< 1	11170
1/29/02	7.62				8.61	7.42		< 1	< 1	< 1	< 1	< 1	11194
2/5/02	7.65				7.84	8.21		< 1	< 1	< 1	< 1	< 1	11270
2/12/02	8.29				8.08	8.34		< 1	< 1	< 1	< 1	< 1	11311
2/20/02	7.54				7.82	7.98		< 1	< 1	< 1	< 1	< 1	11340
2/26/02	7.29				7.38	7.44		< 1	< 1	< 1	< 1	< 1	11356
3/7/02	7.39				8.58	8.39		< 1	< 1	< 1	< 1	< 1	11405
3/12/02	7.51				8.15	9.04		< 1	< 1	< 1	< 1	< 1	11425
3/19/02	7.58				8.22	10.4		< 1	< 1	< 1	< 1	< 1	11514
3/26/02	7.63				8.24	10.5		< 1	< 1	< 1	< 1	< 1	11545

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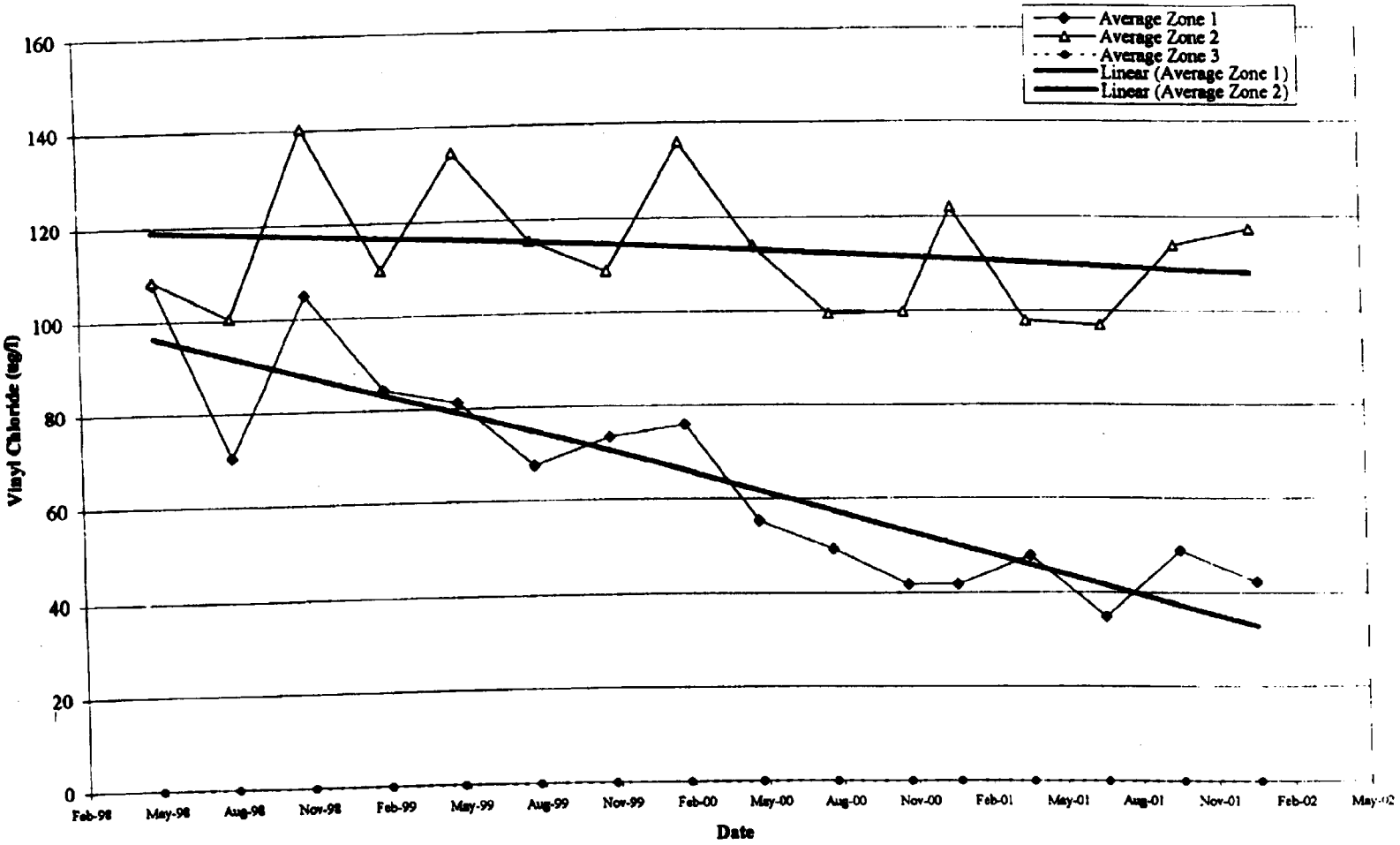
Figure 4 - MWDS Vinyl Chloride Averaged Concentration (By Zone) vs. Time
April 1998 Through March 2002



5104/quarterly/1st2002graphstables

Figure 5 - MWDS Averaged Ammonia Concentrations (By Zone) vs. Time
April 1998 Through March 2002

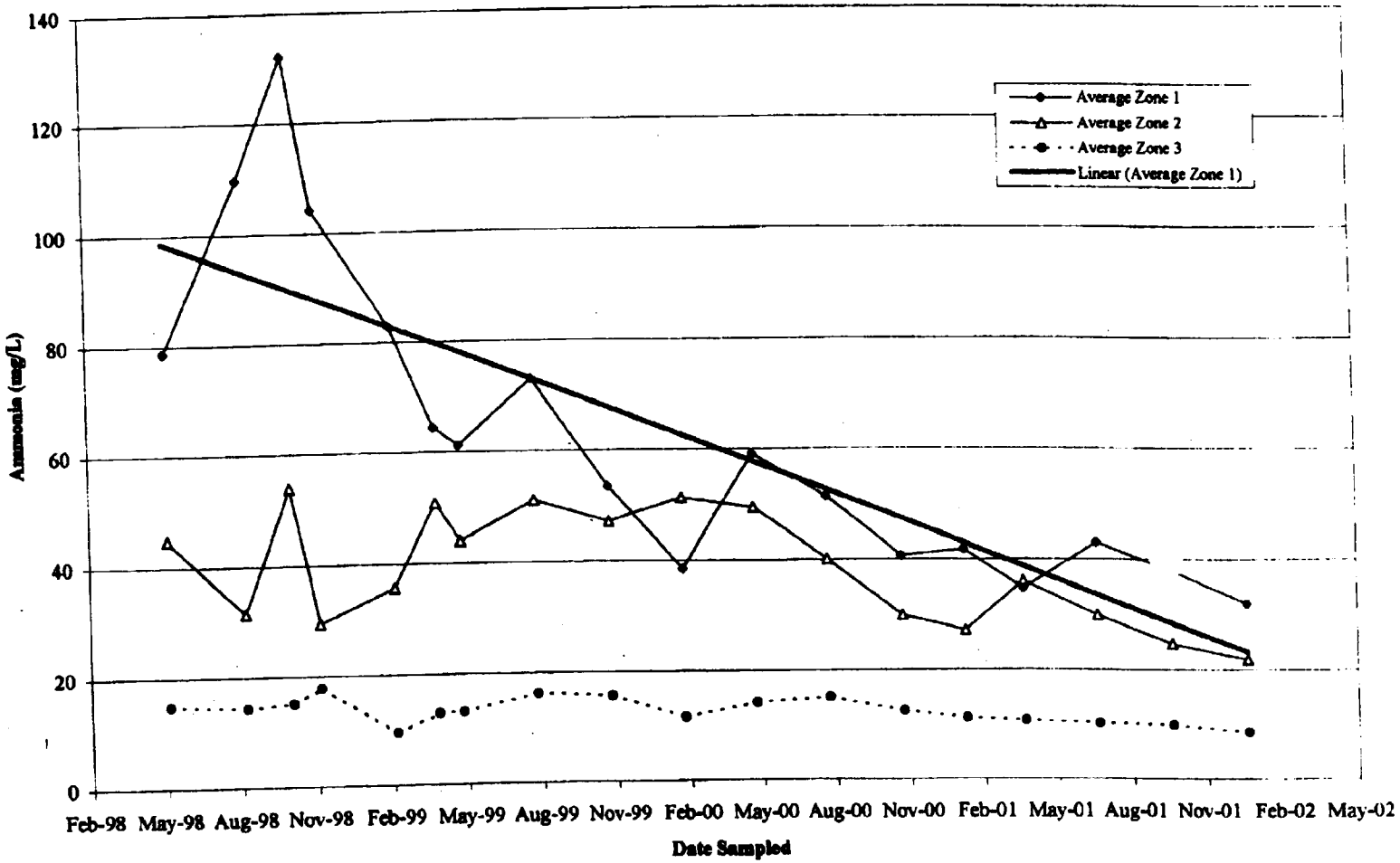
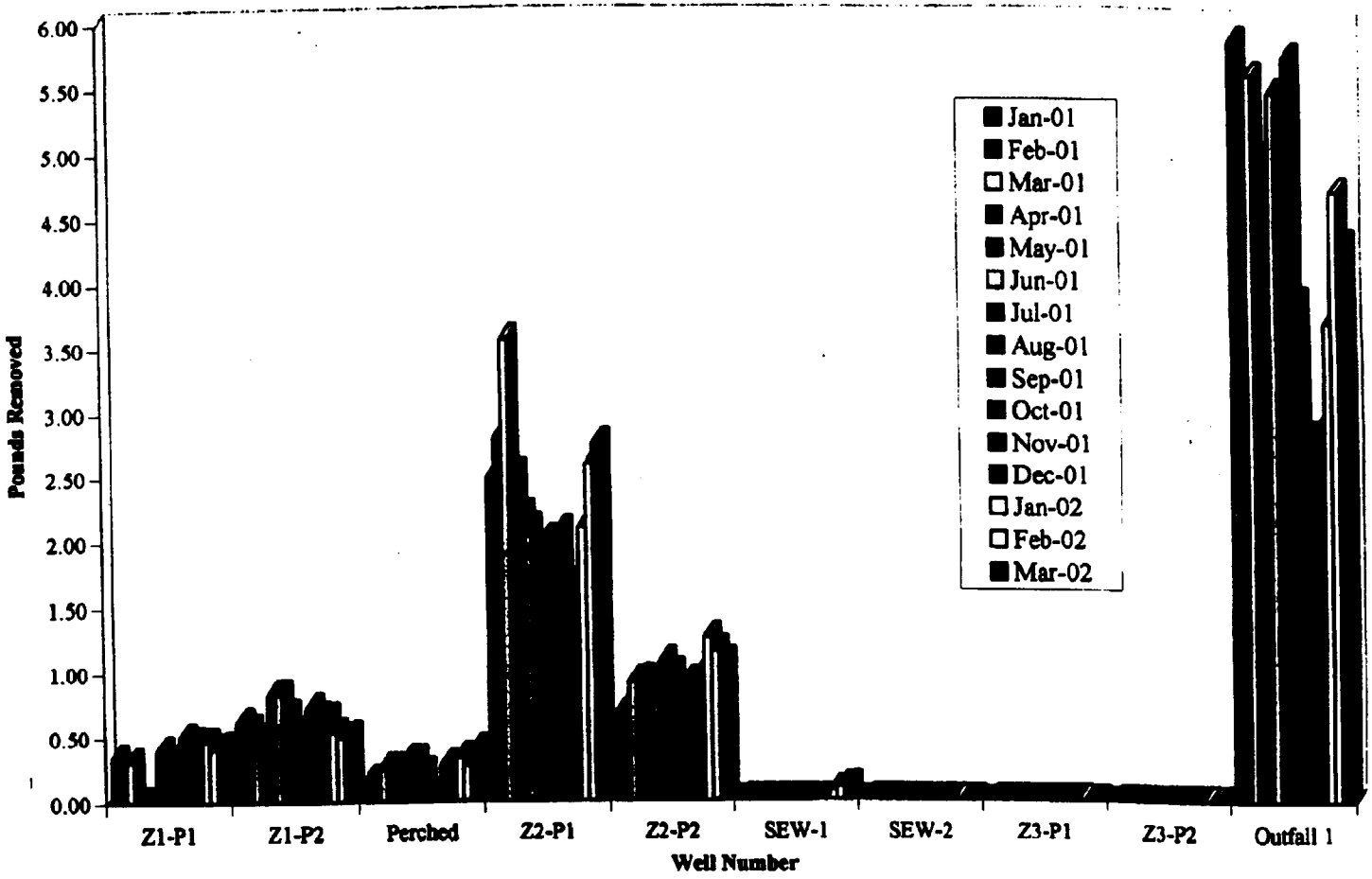
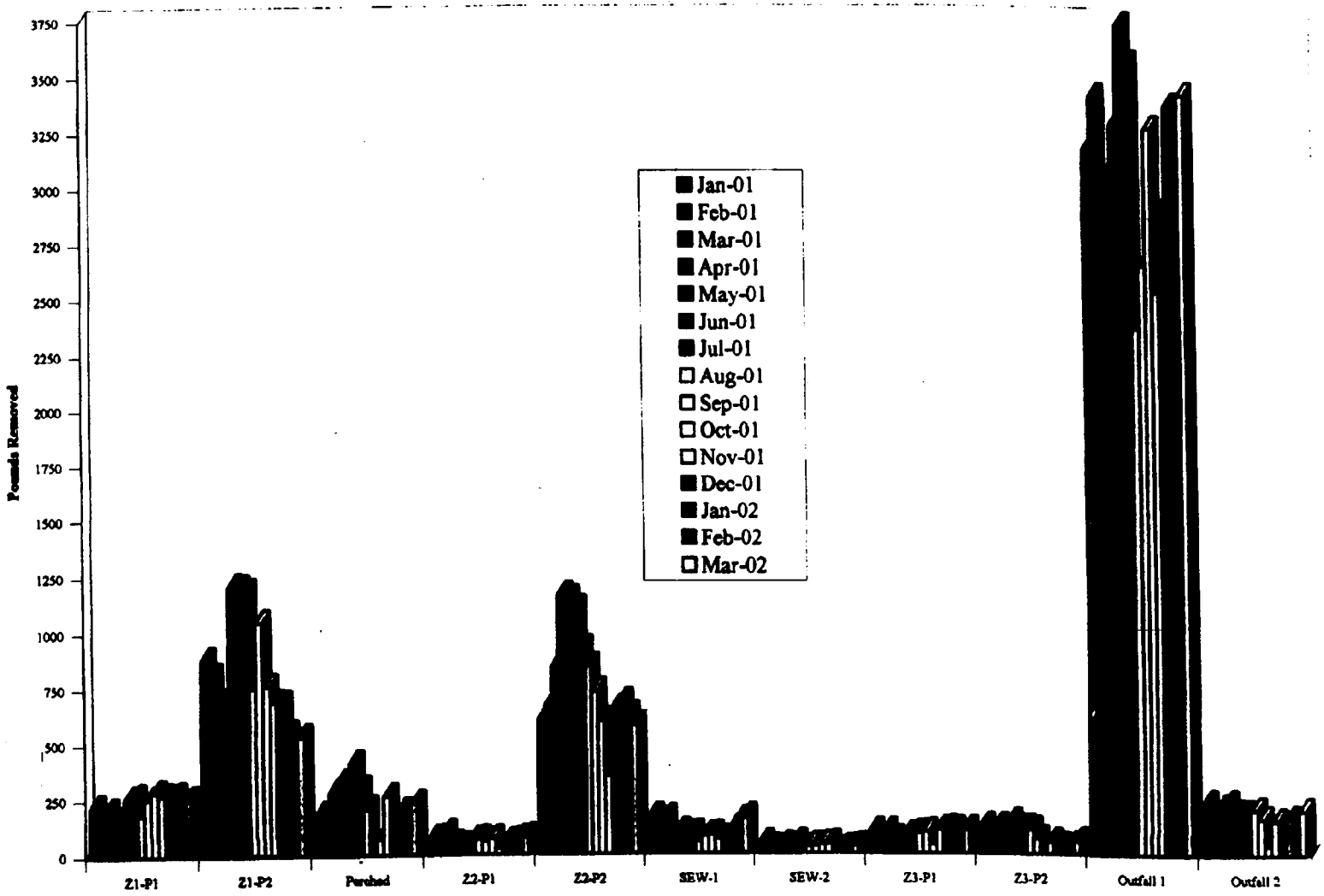


Figure 9 - MWDS Monthly Vinyl Chloride Mass Removal by Well
First Quarter 2001 Through First Quarter 2002



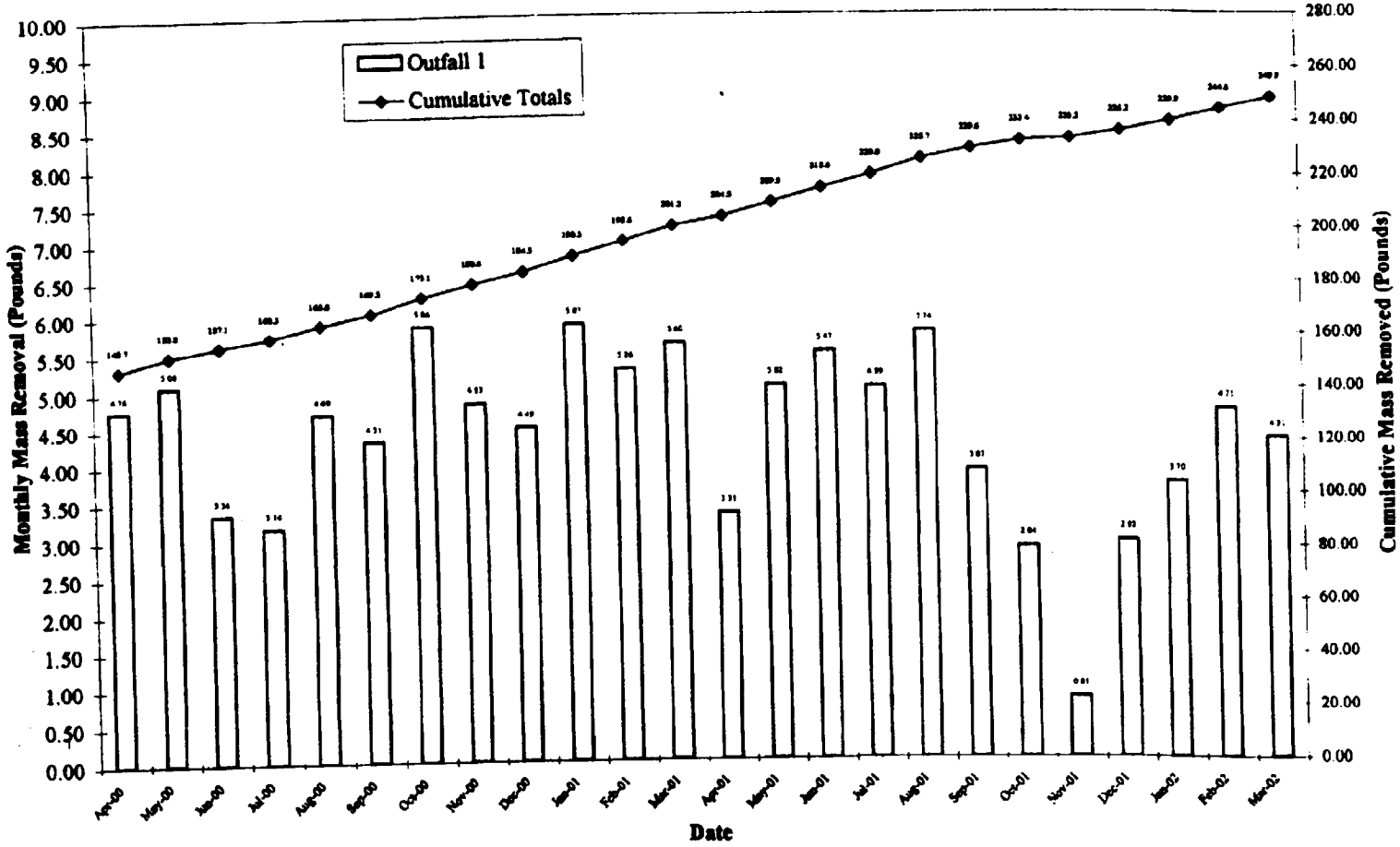
Note: Mass removal by outfall is calculated by the effluent sampling results, so it may not equal the summation of the individual extraction wells.
Calculation of results for Z3-P1, Z3-P2, SEW-1 and SEW-2 have been changed to reflect non-detects as zero.

Figure 10 - MWDS Monthly Ammonia Mass Removal by Well
First Quarter 2001 Through First Quarter 2002



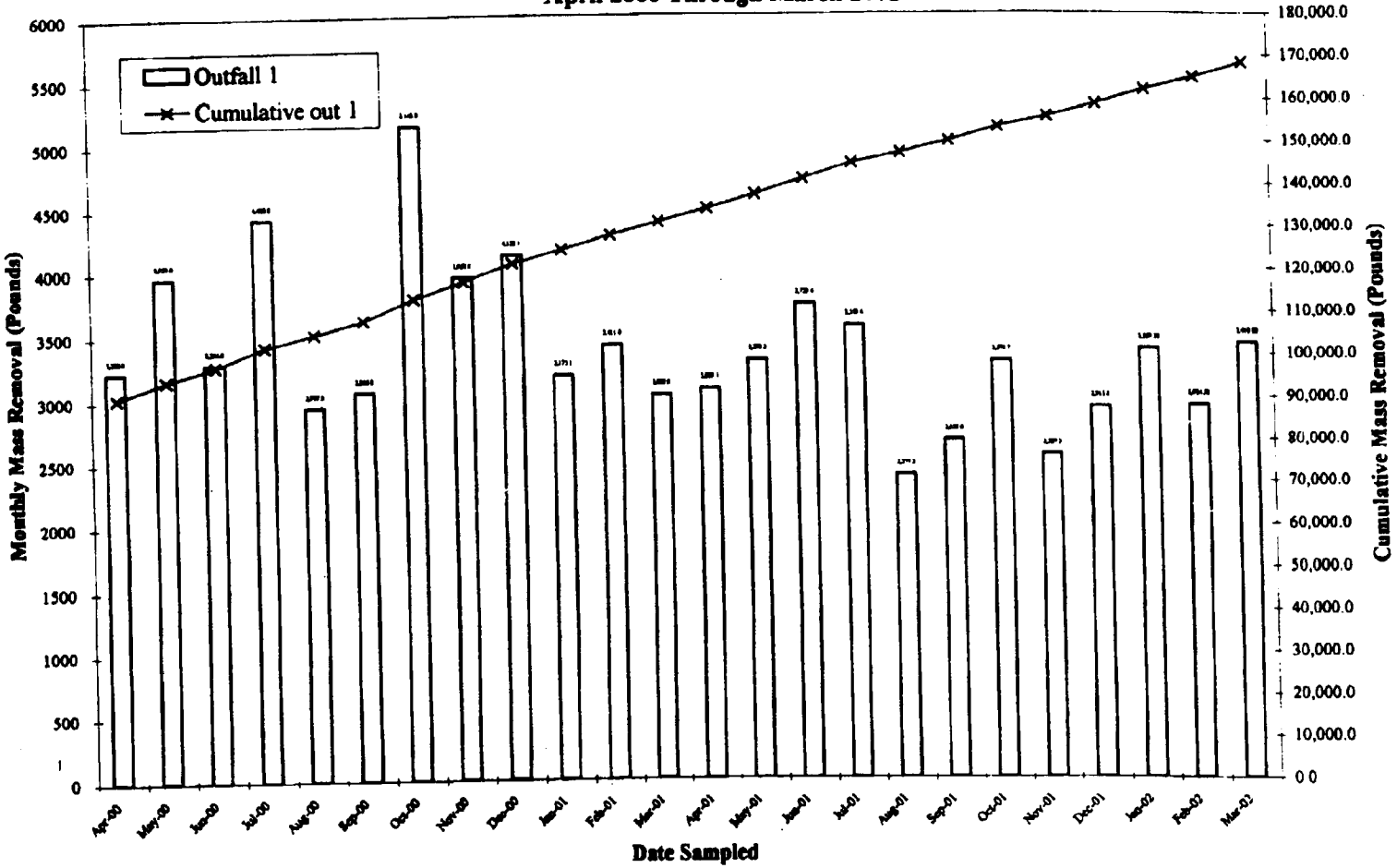
Note: Mass removal by outfall is calculated by the effluent sampling results, so it may not equal the summation of the individual extraction wells.
Z1-P1 April 2001 sample was not collected, January sample used for estimate.

Figure 11
Monthly Vinyl Chloride Mass Removal vs. Time, Outfall 001 (Airstripper)
April 2000 Through March 2002



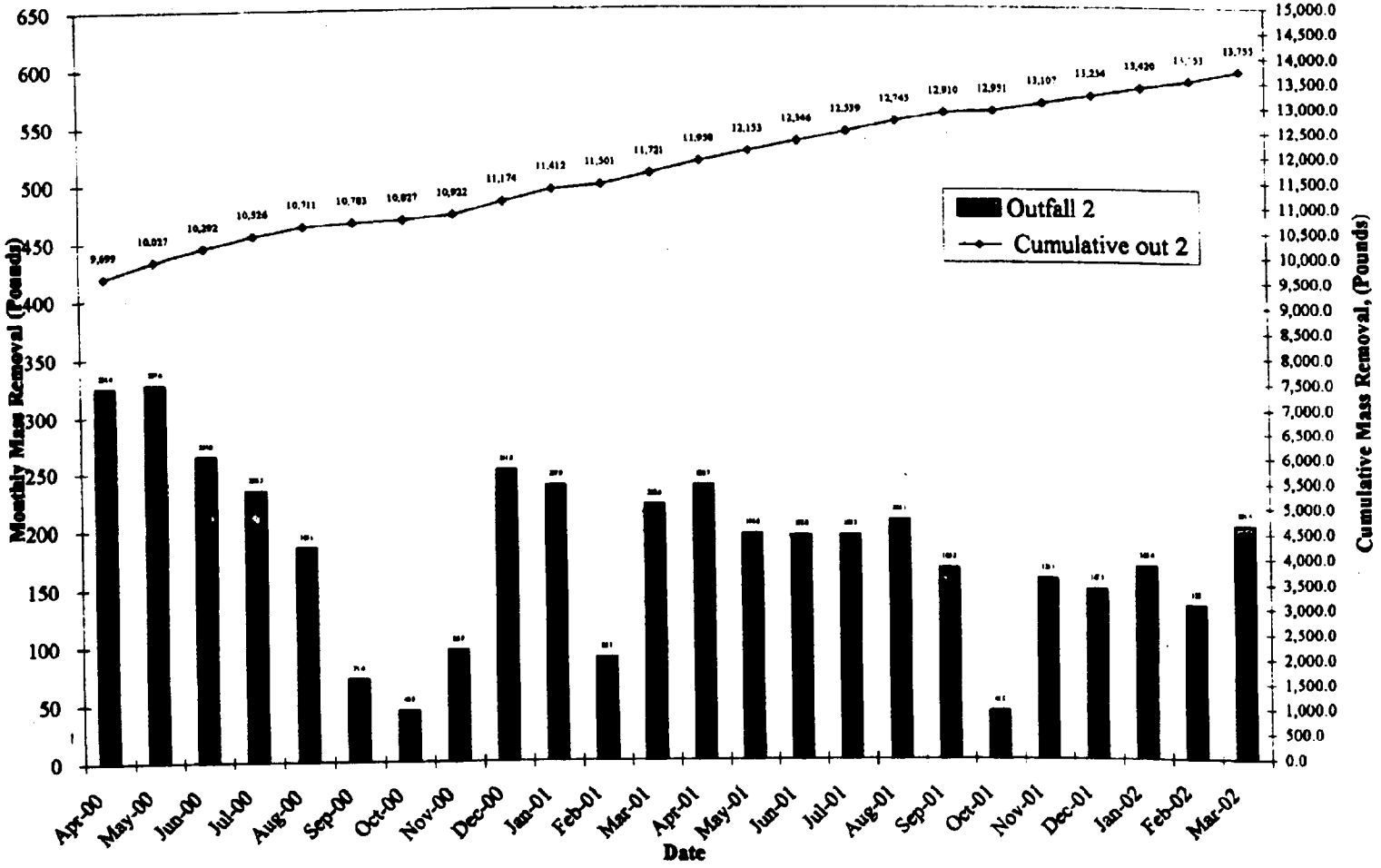
5104/quarterly/1st2002graphstables

Figure 12
Monthly Ammonia Mass Removal vs. Time, Outfall 001 (Airstripper)
April 2000 Through March 2002



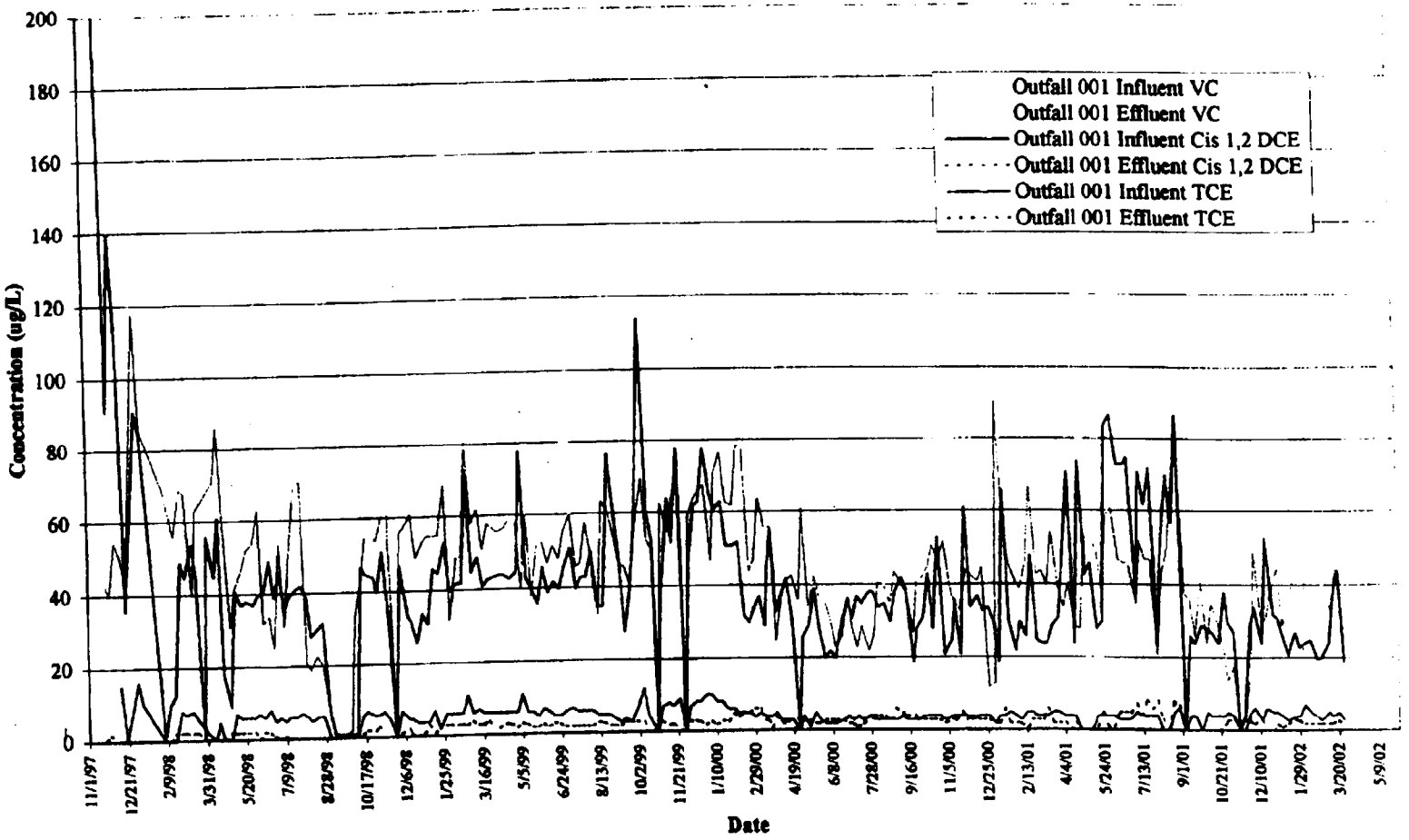
5104/quarterly/1st2002graphstables

Figure 13
Monthly Ammonia Mass Removal vs. Time, Outfall 002
April 2000 Through March 2002



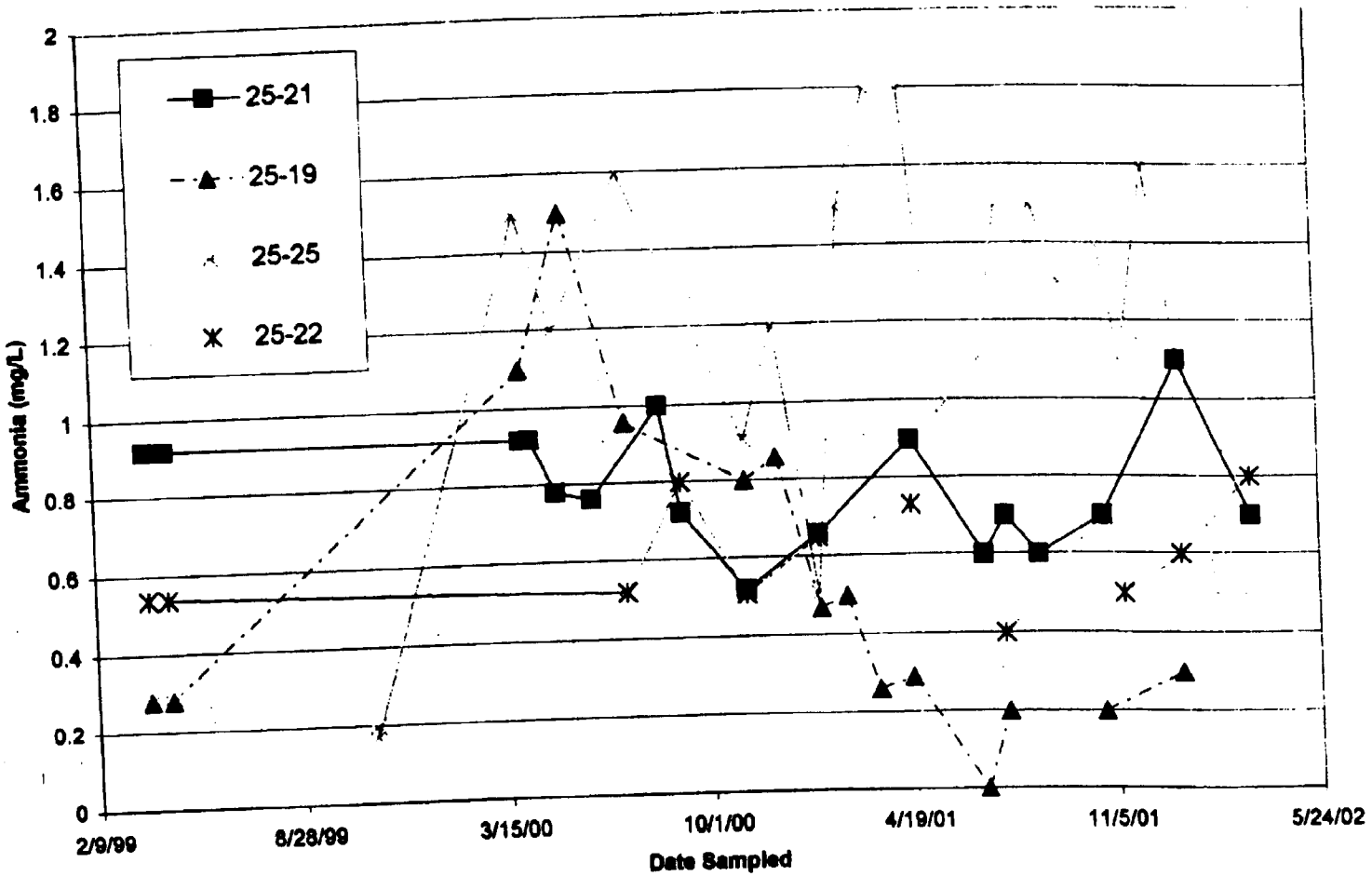
5104/quarterly/1st2002graphetables

Figure 14 MWDS Outfall 001 (Airstripper) Influent/Effluent VOC's
November 1997 - March 2002



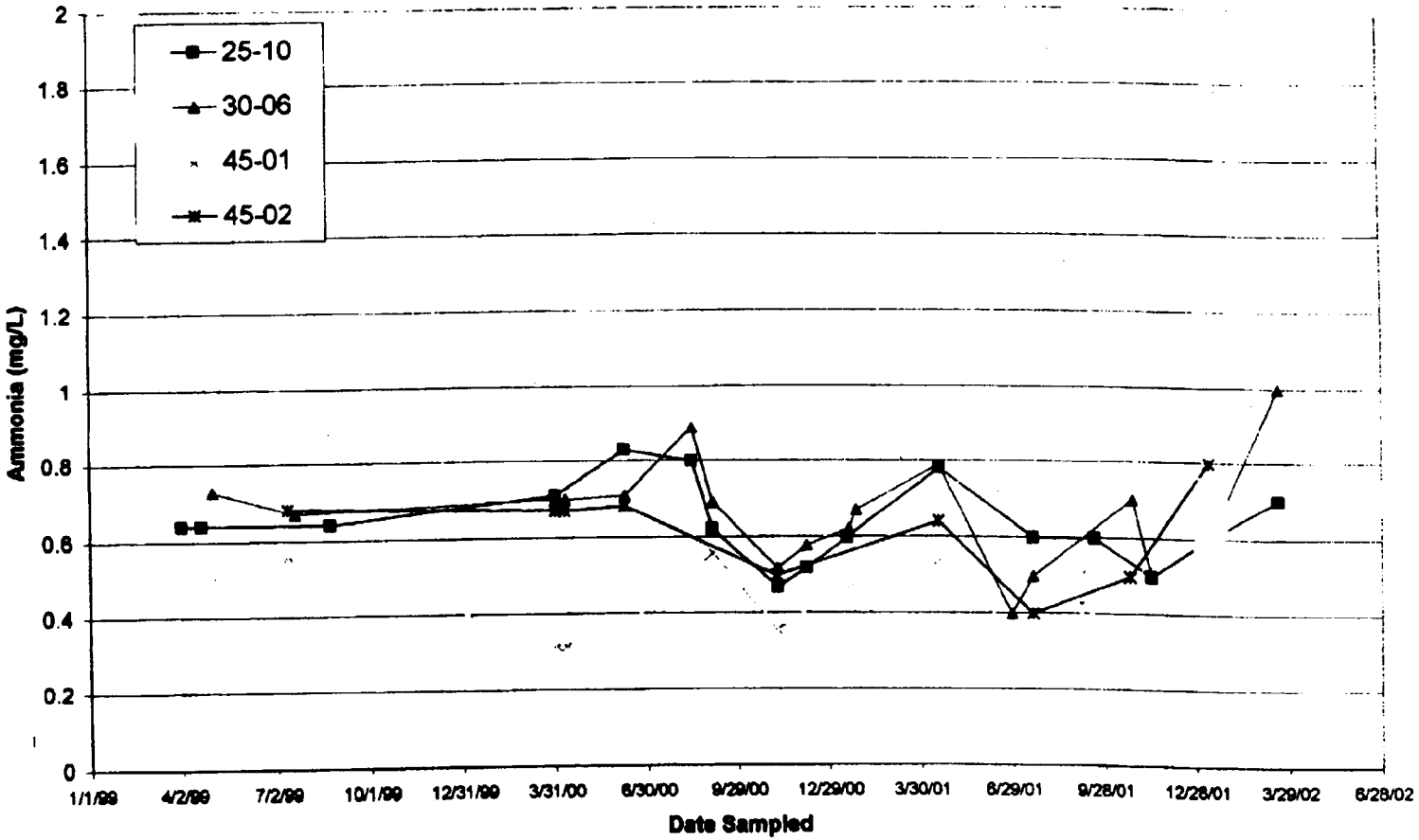
5104/quarterly/1st2002graphetables

Figure 15. Ammonia Trends BWL Wells Northwest of MWDS Plume Through First Quarter 2002



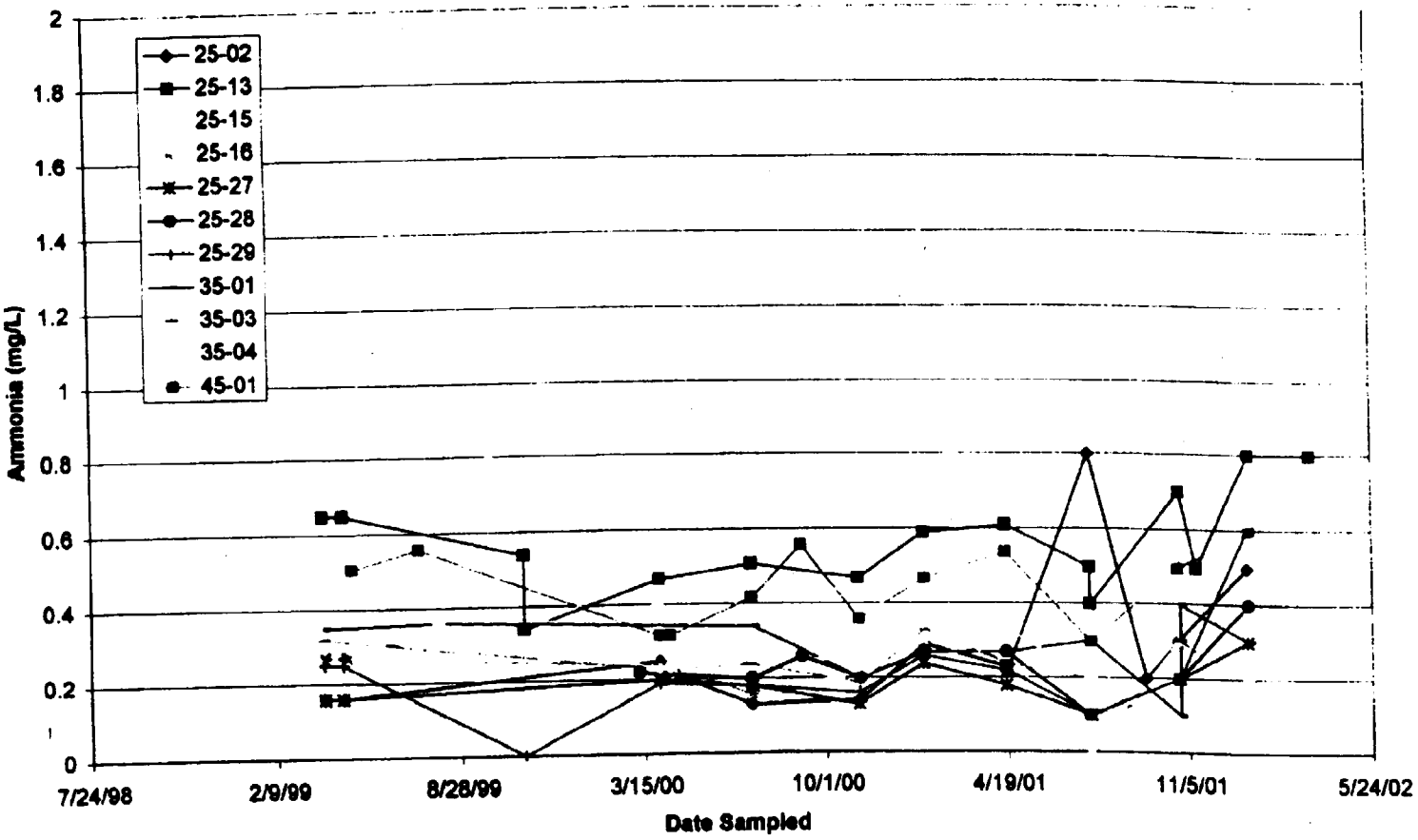
5104/2001/2ndBWLamgraphs1st2002

Figure 16. Ammonia Trends BWL Wells South of MWDS Plume Through First Quarter 2002



5104/2001/2nd2001/BWLamgraphs1st2002

Figure 17. Ammonia Trends Remaining BWL Wells Through First Quarter 2002



5104/qtrly/2001/BWLamgraphs1st2002

APPENDIX

COMMENTS RECEIVED FROM SUPPORT AGENCY

Motor Wheel Disposal Site
Lansing, Ingham County, Michigan
CERCLIS ID# MID980702989; SITE SPILL # 05S5

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 31, 2002

TO: Rob Franks, Project Manager
Site Management Unit 2
Superfund Section
Environmental Response Division

FROM: Charles Graff, Project Geologist
Geological Support Unit
Superfund Section
Environmental Response Division

SUBJECT: Review of the "First Quarter 2002 Monitoring Report for the Motor Wheel Disposal Site in Lansing, Michigan," dated April 29, 2002, Ingham County, Michigan

I have reviewed the "First Quarter 2002 Monitoring Report" submitted by Sharp and Associates, Inc. (Sharp) for the Motor Wheel Disposal Site (MWDS) that I received on May 2, 2002.

Monitoring and extraction wells installed in the glacial and bedrock aquifers were sampled for groundwater chemistry (61) and water level measurements (112) including the Board of Water and Light (BWL) production wells. I have not submitted comments on these reports since the First Quarter 2001 Report due to scheduling and budgetary shortfalls. Many of the same issues raised in past comment letters have still not been addressed. My comments follow:

SUMMARY OF QUARTER 17 COMMENTS

The section entitled "Significant Activities" does not inform the reader as to why corrective actions were needed or what actually happened to necessitate these actions. Sharp should supply more information to this section so that they truly inform the reader of site activities instead of raising further questions. Incidentally, these questions are not answered by reviewing the monthly reports either.

The groundwater contouring for the potentiometric maps in the glacial aquifer are again highly irregular and subjectively illustrated. This is disturbing since these maps are the main weight of evidence for capture in these reports. There are contour lines in Zones 1 and 2 that cannot be located where they are currently drawn based on standard contouring protocol. The resulting maps are inaccurate and convey misleading information. The drawdown cones illustrated in each of these two zones are likewise anomalous. They are too large based on the surrounding water level and chemical data. In Zone 1 the drawdown cones are oriented almost perpendicular to the groundwater flow direction as it is depicted for this zone. This illustration is not possible given the limited data available and what is currently understood regarding the ge

in this area that suggests a north-south oriented channel or more permeable zone, not one perpendicular to groundwater flow.
It has been confirmed in the past two quarterly reports that the water level measurements have not been performed correctly since system start up. The monitoring wells are not allowed to equilibrate before the water level measurements are taken, thus helping to produce some of the anomalous potentiometric maps that have been observed throughout the years. Most of the monitoring wells are of flush-mount design; consequently, it is necessary to fit them with water tight plugs or caps to prevent water collected in the vault to drain into the well. Since the monitoring wells cannot be continuously vented as is standard practice with above-ground monitoring well completions, these flush-mount monitoring wells should be allowed to vent for a sufficient period of time to let them equilibrate with the ambient atmospheric pressure. During the past two sampling events, field staff have taken water-level measurements from monitoring wells in Zone 2, then left them open to the atmosphere overnight, and collected another round of measurements the following morning. Each time this procedure was performed, the water levels changed markedly between measurements: about 0.2 foot on the average (~2.5 inches). Considering that the accuracy of the measurement must be 0.01 foot, this is quite a significant change. As suggested last August 2001 during a meeting, each of the flush-mount monitoring wells should be vented to allow them to reach equilibrium with the ambient atmospheric pressure before water-level measurements are taken. This standard practice should be performed on all of the flush-mount monitoring wells at the site during each monitoring event. If any of the above-ground monitoring wells are not fitted with vented caps, these too should be allowed to equilibrate before a water-level measurement is taken to ensure accurate readings are recorded. Following this standard procedure will assist in producing more accurate and useful potentiometric maps for the future.

The potentiometric map for the bedrock aquifer is also erroneous. It uses data from wells that are screened shallow, intermediate, deep, and are open boreholes. Using data from wells screened at various depths within the Saginaw aquifer does not produce an accurate map, particularly when it has been determined that a downward hydraulic head of several feet exists in the aquifer. These hydraulic conditions must be acknowledged and the maps need to be contoured correctly in all future submittals. Selecting only the monitoring points that are similar in depth will allow for the production of maps that more accurately represent the potentiometric surface in a given area. This requires using water level data from similarly completed wells, i.e., shallow, intermediate, deep, or open bedrock wells. It is understood that there is not a large number of similarly completed wells at this site from which to draw from, but it is not appropriate to mix water level measurements from all of these wells.

There is a lack of hydraulic and chemical capture in glacial and bedrock aquifers: several lines of evidence point to this. The increasing contaminant concentrations in a number of monitoring wells illustrates a lack of chemical capture, the groundwater model suggests hydraulic bypass because the actual pumping rates are less than those deemed adequate in the model, and groundwater contouring does not support capture (if done correctly). This is not to imply that the model can be used to demonstrate hydraulic or chemical capture, but even it corroborates a lack of capture. For example, MW-37 has had continually increasing concentrations of cis-1,2-dichloroethene (DCE) since system start up in Zone 1, yet none of the reports have mentioned any problems with lack of hydraulic capture in this zone. It is noteworthy that this

report suggests increasing the pumping rate in Z1-P1 to "control capture" and then discusses the historical problems with piping at this well. The focus has only been on ammonia and vinyl chloride contamination. Some capture is occurring as a result of the extraction wells; however, it is not complete nor is it adequate as the report implies.

The Saginaw I-SOW groundwater monitoring follows a protocol that does not produce the desired result of collecting representative groundwater samples. First of all, the flow rate is not determined during purging, which is standard protocol during sampling to determine the volume between monitoring stabilization parameters and the total volume purged. The process used for monitoring stabilization parameters does not follow standard United States Environmental Protection Agency (U.S. EPA) protocol either (Puls and Barcelona, 1996), i.e., by monitoring parameters every 2 minutes with a maximum of 5 or 6 readings total. Standard protocol is taking readings every 3 to 5 minutes with specifically established protocol for determining when stabilization is considered achieved for each parameter measured. Finally, the operator is not aware of the correct parameters that he should be seeing from this aquifer, i.e., dissolved oxygen concentrations should not be greater than 8.0 mg/l after stabilization in an anaerobic aquifer. One would expect to see 0.5 mg/l or less in this aquifer, and such dissolved oxygen readings have been recorded from these BWL Saginaw wells in the past. It was not determined whether the instrument had been calibrated recently or not. The current sampling protocol needs to be changed so that representative samples can be collected from these BWL wells. Some of the results from a number of these wells have unusual final stabilization parameter values, which puts into question the chemical concentration values as well.

There is a continuing problem of misinformation regarding the Groesbeck Drainage District,: where the water allegedly drains to, and the use of very shallow wells (e.g., BL-MW-1-S) to support a false premise of a large groundwater mound and the resulting potentiometric surface. Nearby monitoring wells to the south also have elevated water levels; however, the elevations are far less (5 feet less) and these wells are just north of the actual location of the designed infiltration area at Bancroft Park. I suggest that Sharp sound the questionable shallow wells to determine how deep they actually are and submit construction logs to clear up the issue of these shallow-screened wells. If deeper monitoring wells are available nearby (similar screen depths to the MWDS wells) for water level measurements, these should be used instead. The physical drainage patterns east of the BWL fly ash pit also appear to be different than what the text indicates. Surface water apparently drains into Bancroft Park, not to the fly ash pit area. From the large pond at the northern end of the park, the water is drained into successively lower ponds to the west.

A number of BWL wells have ammonia concentrations within the 0.6 to 0.9 mg/l range that puts them on the schedule for bimonthly sampling. Table 6, however, does not indicate that these wells were changed to bimonthly status; they are still listed as being sampled quarterly. This sampling frequency must change to match the ammonia concentration criteria listed on page 15. BWL well 30-06 was changed from bimonthly to monthly due to increasing ammonia concentrations.

There is a continuing problem in these monitoring reports regarding the ability to demonstrate hydraulic and chemical capture with this treatment system. In Zone 1 and Zone 2, capture is inadequate based on water level measurements and chemical bypass. In Zone 3, not enough

data points are present to demonstrate hydraulic or chemical capture. There are also not sufficient monitoring points near the extraction wells in the bedrock aquifer for an adequate demonstration of hydraulic or chemical capture. One bedrock well was installed last year (MW-94) near the extraction wells, but more are necessary, especially if the bedrock plume is allowed to expand toward these extraction wells.
Lack of hydraulic and chemical capture in the glacial aquifer will allow more contamination to migrate into the bedrock aquifer and further south along the glacial plumes. This deficiency will prolong the time, increase the risk to the municipal water supply, and increase the money required to remediate the glacial and bedrock plumes.

Some monitoring wells are still being sampled with disposable bailers. We have asked on numerous occasions for explanations to this protocol as it is described in the text "...several of the shallower wells...with low purge volumes continue to be sampled using new, disposable bailers." No response has been given, and site conditions do not justify the use of bailers. Vinyl chloride is highly volatile and is readily lost to the atmosphere. There are more appropriate methods to collect groundwater samples containing vinyl chloride and the other volatile site compounds. This method would also eliminate sampling variability inherent with the bailer technique.

As noted later in this document, bedrock monitoring-well MW-65 is being used as evidence that the vinyl chloride plume is present north of this well. It had also been used in the past to support the ammonia plume boundary north of this location, although ammonia in monitoring wells to the south disproves this assumption. This well has produced anomalous groundwater chemistry since it was completed. All evidence supports a problem with the well completion. This location should be returned to use as a viable monitoring point.

ACTION ITEMS

These are issues that require correction to bring the remedy into compliance and to improve the quality of the monitoring reports:

- Need to attain hydraulic capture in Zones 1 and 2 through increased pumping of existing extraction wells or more likely through the installation of additional extraction wells.
- Need more monitoring wells to determine chemical and hydraulic capture in Zone 3.
- Need monitoring wells near the present bedrock extraction wells to determine their effectiveness in attaining hydraulic and chemical capture. One well was just placed between these two wells, but more are needed to ascertain these capture issues, especially whenever SEW-3 and SEW-4 are put on line.
- Anomalous water level measurements still persist in the monitoring well network that should be rectified.
- Discontinue sampling with bailers to improve the data quality and sample representativeness from all monitoring wells.
- Sample chemical data from PZ-4 to ascertain the actual effectiveness of the Zone 1 extraction wells.
- Change the sampling procedure for the two open-hole, bedrock monitoring wells, MW-75 and MW-78, by installing a viable multiport monitoring system that will allow discrete

sampling and water-level measurements versus the homogenized data that are currently collected.
- Finalize the bedrock plume delineation in order to determine effectiveness of extraction wells to actually capture the plume.
- Change the current sampling procedure being followed for the BWL wells that will allow for more representative sample collection. This can be accomplished by following standard low-flow sampling protocol.
- Increase the sampling frequency of monitoring wells with chemical exceedances, MW 37, or increases as with IC-7, MW-63, 45-01, 45-02, and 25-29.
- Take steps to provide a viable monitoring point at the MW-65 location once again.

SPECIFIC COMMENTS

Page 3, Section 1.0 Significant Activities, Section 1.1 January 2002
Bullet 7 indicates the flow rates were adjusted for Zone 2 and Zone 3 extraction wells. It is not clear whether they were turned up or down or why. Clarification would be helpful.

Page 4, Section 1.2 February 2002 and Section 1.3 March 2002
The text notes that a new sampling pump was ordered to replace the Fultz pump. It does not indicate why the Fultz pump needed to be replaced or describe its replacement.

Page 5, Section 2.0 Plume Evaluation, third paragraph. The text mentions that "...several of the shallower wells...with low purge volumes continue to be sampled using new, disposable bailers." The text has never indicated what "low purge volumes" actually means. If the aquifer can deliver an adequate flow of groundwater, and there is no indication that it cannot, then it would be prudent to use more appropriate means to collect the groundwater samples instead of using a bailer. Non-dedicated low-flow pumps similar in design to those already in use at the site as dedicated pumps could be used in these monitoring wells. The bladders and tubing are all disposable, so the decontamination issue would be minimal and the results would be more representative of aquifer conditions. Using non-dedicated sampling pumps significantly reduces the sample variability that is inherent with bailers. Using a sample pump would also allow sample collection after aquifer parameters have stabilized producing samples representative of aquifer conditions. Purging an arbitrary well volume may or may not produce accurate results (it would not be quantifiable) and more volatiles are lost using a bailer. Bailers should only be used in monitoring wells that cannot produce adequate groundwater to satisfy the low-flow sampling protocol. This demonstration has not been made and it is doubtful whether it can be made considering the ability of the glacial aquifer to produce sufficient groundwater based on the available hydraulic conductivity data.

The text then goes on to discuss the two open borehole bedrock monitoring wells, MW-75 and MW-78, and "...that [they] require higher purge volumes..." There has never been any answer as to why these wells were completed as open boreholes, although this was asked before they were drilled. This high purge requirement appears to be an arbitrary decision made at some time in the past. No supporting evidence is offered, nor is the said protocol found in Appendix F, Comprehensive Groundwater Monitoring and Sampling Plan of the Final Design Report. In addition, these wells should not be completed as open borehole wells. Collecting the data in this

manner provides homogenized hydraulic head and chemical data, which are not comparable to other site data and make it quite difficult to assess site risks: these boreholes are open to hundreds of feet of the Saginaw aquifer. These wells should be fitted with discrete point sampling equipment (not a double packer system) to halt and prevent the current inter-borehole mixing that produces questionable results.

Section 2.1, Chemical Evaluation of the Glacial Contaminant Plumes

Vinyl Chloride

A number of monitoring and extraction wells (12) indicated continued increasing concentration trends of vinyl chloride over the past few quarters, both north and south of Zone 2. These trends are for the most part ignored. Why these numerous wells should have increasing trends of contaminants is rather an essential issue regarding the effectiveness of this treatment system. Unfortunately, the topic is not properly addressed. The reader is lead to believe that the few changes that are mentioned are not significant. A discussion of these trends should have been part of this section. These increasing trends of vinyl chloride do not support chemical capture of this plume.

Third bullet. The concentration of vinyl chloride in MW-39 increased since its last sampling event up to 210 µg/l. The text disregards this large increase by stating that the levels "...increased to correspond with historical trends..." Considering that this monitoring well is only sampled once per year, one would expect to see a significant reduction from year to year while the system is supposed to be removing contaminants, not a dramatic increase. By stating that the current concentration of vinyl chloride is back to "historical trends" sidesteps the issue of the effectiveness of this treatment system. The increase observed in MW-39 combined with the increases in monitoring wells directly south of this well suggest a lack of adequate hydraulic capture.

Page 6, second bullet. The drop in concentration of vinyl chloride in MW-71 a few quarters ago to below 2 µg/l was noted as evidence that capture had finally been achieved out to this well. No other data corroborated this claim, however. Now for the past 2 quarters MW-71 has had 2 µg/l of vinyl chloride, but there has been no corresponding discussion regarding the lack of hydraulic capture to this monitoring well. The water level data clearly indicate that no hydraulic capture and, for the most part, no hydraulic influence is reaching out to MW-71. Hydraulic capture must reach MW-71 to prevent the continued loss of contamination east of extraction well Z2-P1 from migrating to the south. Z2-P1 has been turned up to its highest rate for several years now (January 1999) without any increase in hydraulic capture at the eastern edge of the vinyl chloride plume. It is significant to note that MW-76 is less than 10 feet east of the extraction well and has similar water levels as wells much farther away, suggesting the extraction well exerts little influence in the aquifer. Additional actions must be taken without further delay to achieve capture east of pumping Zone 2. See previous discussions regarding this issue in past comment letters for more information.

Cis-1,2-Dichloroethene

There was no mention in this section that MW-37 exceeded cleanup concentrations (70 µg/l) this quarter with results of 73 µg/l. The focus of the discussion was primarily with off-site contamination to the north. As noted in past quarterly comment letters, MW-37 has had a

steadily increasing trend of DCE since system start up—which is also not mentioned. This monitoring well is not sampled quarterly; it appears to be sampled semiannually. I suggest that this monitoring well should be returned to quarterly or more frequent sampling, based on the DCE exceedance in MW-37, and that corrective actions be taken to actively address the lack of hydraulic and chemical capture in Zone 1 to reduce these contaminant concentrations as was the original intention of this remedy.

Ammonia

Second bullet. The chemical data from monitoring wells MW-12D and MW-36 are not necessarily optimum for establishing a plume separation of ammonia between the Zone 1 and Zone 2 extraction wells. MW-12D is west and downgradient of Z1-P2, and MW-36 is somewhat east in being downgradient of Z1-P1. MW-31 has still almost 300 mg/l ammonia and is directly downgradient and between the two Zone 1 extraction wells. However, MW-31 is not even discussed in this section as one would expect. The top of the currently illustrated (Figure 2) ammonia plume is an area that includes MW-31 and the piezometer PZ-4. This piezometer is closer to the extraction wells than MW-31. This piezometer should be sampled to support the assumption of plume separation, and consequently, the effectiveness of the Zone 1 extraction wells. If PZ-4 were below 34 mg/l ammonia, this would lend support for the separation of the ammonia contamination into two plumes. If not, this piezometer would indicate breakthrough between the two extraction wells as MW-31 already appears to do. It is important to gather all available data to support the position of plume separation; otherwise, this is just conjecture. The ammonia plume may be simply necked down and not separated at all. The MW-31 ammonia results continue to illustrate the lack of hydraulic and chemical capture of Zone 1.

MW-31 should not have had the dramatic increases in ammonia concentrations that it has exhibited in the past, and it should have much less ammonia in it than it currently does since it is directly downgradient and between the Zone 1 extraction wells. One would expect clean water to be flushing through the aquifer beyond the "capture zone" of Zone 1 if it is truly effective, thus reducing contaminant concentrations dramatically. See the ammonia chart at the end of this document.

Page 7, Section 2.2 Hydraulic Capture in the Glacial Aquifer Plume

The text does not discuss whether hydraulic capture it is actually occurring or not. However, the data do not support hydraulic capture. Unstabilized water level measurements also complicate the analysis of hydraulic capture and influence.

The flow lines on the potentiometric maps (Figures 3, 3A, 3B, and 3C) are not realistic and it is not possible to base hydraulic capture on these lines alone as the text implies: they are questionable considering they are based on unusual contour lines.

During 2001 Sharp stopped producing the cross-sectional views of each pumping zone that were used to help illustrate the potentiometric surface developed by the extraction wells. The depictions of the cross sections had been problematic in the past; however, done properly, they are quite helpful in providing a better understanding of the hydraulics in each pumping zone. These cross sections have been dropped without explanation, but should be put back in to future reports. The contouring itself does not supply satisfactory information for demonstrating hydraulic capture.

Troll data were collected for almost one year from an agreed upon set of glacial and bedrock monitoring wells. A review of the data submitted in the Fourth Quarter Sampling Report indicates that one of the wells was never monitored: MW-68. This monitoring well was chosen because it is surrounded by a number of glacial monitoring wells, and if the BWL production wells were having an impact on glacial water levels, this monitoring well should have illustrated this relationship. It is not clear and has not been explained why this monitoring well was not part of this study. The data collection was stopped without discussion or analysis of the data. It is still important to determine whether water levels in the glacial aquifer are directly affected by the intermittent functioning of the BWL production wells. This information could still be collected during the course of a quarterly sampling event.

Second bullet. From discussions with BWL personnel, it is understood that there never was open water within the BWL North Lansing Landfill (NLL), or fly ash pit. It had been dry for years after its use as a gravel pit, which is why they began to landfill the fly ash into it. It is not clear why this statement is being routinely included in this report. It appears erroneous in nature, and if it is, this information should be removed from this and future reports.

This bullet continues by indicating that "...the area east of the landfill is receiving infiltration of storm water runoff, as evidenced by the water levels in monitoring wells in the area." This supposition relies mainly on water level data from two monitoring wells: BL-MW-1-S and BL-MW-2-S. Both of these wells appear to have rather shallow well screen locations. The storm water apparently drains to the Bancroft Park area instead. The data from BL-MW-1-S should not be used for potentiometric surface estimations. The consultants, who monitor the wells in and adjacent to the NLL, Natural Resources Technologies, Inc. do not use this well since it provides unusually high water level elevations and uncharacteristic groundwater geochemistry. This monitoring well is part of a well cluster and has the shallowest screen of the group. BL-MW-1-S is also adjacent to an artificial pond that is used for holding cement truck wash water, explaining some of the anomalous chemical and hydraulic data it produces. There are apparently other monitoring wells in this cluster with well screens at similar elevations as the MWDS wells that may provide better quality data. A more suitably screened well should be used for water level measurements from this area. There has not been any explanation for the use of this well for several quarters' worth of comments. In addition, considering the infiltration area is mostly along the northern edge of Bancroft Park, it is unclear why a well so much farther north and west of a number of monitoring wells adjacent to this area is being used to support a claim of infiltration. Monitoring well BL-MW-2-S may be similar in construction as well, and if its screen is also too shallow, then a deeper screened well should be used instead. As noted earlier, these wells should be plumbed to establish the screen depths, and construction logs should be submitted since they are included in routine site sampling.

Zone 1

The water level was not measured in PZ-4 during this sampling event, yet the contouring is performed as if there were data at this location.

First bullet. Figures 3 and 3A exhibit very unusual groundwater contour lines. The resulting groundwater flow lines (red) simply amplify the inaccuracies of the contour lines, i.e., if the

contour lines are inaccurate, so will be the flow lines. Both sets of lines do not seem to follow typical norms established for generating potentiometric maps. The contour lines are supposed to simulate the natural contour of the water table surface, but it is highly unlikely that the water table surface is as contorted as these figures indicate. The anomalous potentiometric readings could be the result of measuring unstabilized water levels in these monitoring wells. These unusual depictions of the potentiometric surface for Zone 1 are biased in favor of hydraulic capture. There appears to be some containment from the two extraction wells, but it does not appear to be sufficient to prevent breakthrough or achieve complete hydraulic capture. See below regarding lack of hydraulic capture out to MW-37. The edge of the plume is apparently east of this monitoring well. Also see the charts at the end of this document.
MW-37 has had steadily increasing concentrations of DCE since system startup in 1997: this quarter reaching 73 µg/l. For the first time there is a discussion regarding this increase in DCE in this report, but no correlation as to how the persistence and increase of this contaminant may be due to an historical lack of hydraulic capture on the eastern side of Zone 1. If the larger piping does not allow hydraulic capture to include MW-37, then additional steps must be taken to achieve this capture. The next bullet discusses hydraulic capture to the east, but no specifics are given, only that the "...eastern capture of Zone 1 continues to be aided by groundwater mounding...to the east..." It appears that hydraulic capture to the east can be assumed; but based on the chemistry of MW-37; this does not appear to be the case.

Second bullet. As just noted above, the hydraulic capture east in Zone 1 is assumed, not specified with supporting data as to how far the capture zone extends. This bullet discusses the "infiltration benefit" coming from the east from the Groesbeck Drainage District. The monitoring wells that are actually closest to the drainage area near Bancroft Park should receive the attention pertaining to hydraulic influence on the MWDS extraction system, not BL-MW-1-S that is the northernmost monitoring well near the BWL fly ash pit away from Bancroft Park. It is also uncertain whether BL-MW-2-S is screened appropriately to provide representative water level data. MW-37, MW-14, and MW-77 are too far removed from the infiltration at Bancroft Park to be affected by it as the text suggests. The text also indicates that the measuring point elevation "...of BL-MW-1-S has been confirmed and that the data are included on the map for this quarter." The only issue that I am aware of with this monitoring well is the shallow screen location, not a measuring point.

Page 8, fourth bullet. The pumping rate of Z1-P1 needs to be increased to achieve capture, not "control" it as the text indicates. The reason cited for this needed increase is that the DCE in MW-37 has a "...continued increasing trend...," but this has been occurring since 1997 as Appendix A clearly illustrates. This quarter the concentration of DCE in MW-37 is above the cleanup standard, but this is not mentioned.

Zone 2
First bullet. This bullet states "Flow lines indicate that capture of both...plumes continues north of the pumping wells, where full capture width is developed." This supposition rests entirely on the contouring and the subsequently drawn flow lines (red) as seen in Figures 3 and 3B. These flow lines are what the strength of this discussion rests upon. As noted in the Zone 1 contouring, if the contour lines are inaccurate, so will be the flow lines. In addition to these problems, the capture of the plumes is supposed to occur at the pumping wells, not north of

them some arbitrary distance that is not mentioned. The Zone 2 extraction wells are designed to "...cut off the plume before entry to the lower (Saginaw) aquifer...," from the Final Design Report. Further, "The point of compliance wells will be utilized during the ongoing remediation program to delineate the effective capture zone of the extraction wells...," from Appendix J of the Final Design Report. MW-71 and MW-81 are the designated point of compliance wells in Zone 2. The groundwater gradient between MW-71 and the closest extraction well in Zone 2 is away from the extraction well by 0.1 foot, not towards it. It is obvious that from the start of this project the hydraulic capture in each pumping zone was designed to be effective in stopping the further spread of contamination beyond the extraction wells of that particular pumping zone and was supposed to be demonstrable in the point of compliance wells. The cone of capture is supposed to reach out to these point of compliance wells. However, this does not appear to be the case this quarter—or in past events—based on water level or contaminant data observed. The contamination that bypasses the Zone 2 extraction wells is free to migrate into the Saginaw aquifer below and further south, contrary to the required design of this system. Allowing this contamination to continue to bypass the pumping zone will prolong the cleanup of the bedrock and glacial (Zone 3) aquifers. Of note is that vinyl chloride concentrations have increased toward the south in a number of monitoring wells for several quarters now.

Second bullet. The increased pumping rates beyond the design rate of 45 gallons per minute (gpm) at each extraction well still does not appear sufficient in developing an effective capture zone in Zone 2 as the data clearly illustrate. Sharp suggests that there may not be sufficient cone of capture overlap between these two extraction wells. Data have indicated this for years. They cite increasing trends of vinyl chloride in MW-85 as proof. Other monitoring wells that illustrate this trend are: MW-86, MW-39, IC-7, MW-49, and MW-41. The monitoring wells further to the south indicate that chemical breakthrough has been occurring for many years.

Page 9, first bullet. The practice of allowing these flush-mounted wells to vent until the water levels equilibrate with the ambient barometric pressure should be performed on each unvented monitoring well at the site: this is standard protocol. This will help provide more useable data for the potentiometric maps.

Zone 3

Second bullet. The last sentence in this paragraph is not in agreement with conventional hydrogeological concepts. This sentence attempts to explain that the upper portion of the aquifer flows to the southwest or west while the lower portion flows to the south. Groundwater flow does not change directions at differing elevations in an aquifer without hydraulic boundaries separating these different zones, e.g., the presence of aquitards. No such boundaries have been detected in the aquifer in the respective discussion area: PZ-7 and the Zone 3 monitoring wells This sentence should be removed or the theory should be revised.

It is highly likely that the water level readings from PZ-7 are not accurate with respect to actual aquifer conditions. During drilling, the glacial till was encountered at a shallower depth than the next closest monitoring wells, about 40 feet higher. The boring was advanced an additional 40 feet into this till. The subsequent slug test on the completed piezometer took about a minute to recover as opposed to seconds as seen in the other piezometers, indicating a serious problem with its connection to the aquifer. The cuttings from the till were brought to the surface along the

flights of the hollow stem augers. It is quite likely that the lower permeability materials of the till were smeared along the borehole to the surface during this drilling process. The subsequent well development was substandard since it was performed with a groundwater-sampling pump. It was not aggressive enough to remove much material from the area adjacent to the slotted PVC screen. The results of the slug test also support poor communication with the aquifer.

The concentrations of ammonia in MW-63 have jumped significantly from 2.21 mg/l to 17.8 mg/l. This increase in ammonia does not support an assertion of hydraulic capture; in fact, it supports a shift of the plume to the west. It appears that this monitoring well is sampled once per year. I suggest changing this frequency to quarterly for the short term given the unusual increase in ammonia concentration.

Page 10, Section 2.4 Chemical Evaluation of the Saginaw Aquifer Plumes

Vinyl Chloride

The absence of vinyl chloride in MW-65 is used to support the vinyl chloride plume boundary as being located north of this monitoring well. This assumption has problems. The groundwater sample used to locate the well screen in the boring had the highest concentrations detected within the borehole during vertical aquifer sampling: 173 mg/l ammonia, 4 µg/l vinyl chloride, and 82.4 mg/l potassium. Subsequent sample concentrations dropped off dramatically after well completion, whereas samples from MW-67 and MW-68 have not dropped off in a similar fashion. Monitoring wells do not "clean up" to such low concentrations naturally in such a short span of time (less than one year). MW-65 had ammonia concentrations above 34 mg/l near the top of the Saginaw aquifer to the total drilling depth. There definitely appears to be a problem with the completion of this monitoring well in allowing the collection of representative aquifer samples. Steps should be taken to provide a viable monitoring point in this area once again.

Page 11, second bullet. As noted earlier, the sampling protocol used for the BWL wells should be changed to follow more standard accepted protocol to produce more representative results. The corresponding dissolved oxygen result for the March 2002 sampling was 3.95, far too high for an anaerobic aquifer.

Third bullet. This bullet indicates that ammonia concentrations have decreased slightly in monitoring wells around the boundary of the plume. MW-68 and MW-66 are not near the plume boundary. The boundary is farther to the east, but there are no monitoring wells to define this.

Fourth bullet. The highest concentration from MW-93 was greater than 17.7 mg/l ammonia and was taken from the upper portion of the borehole before it was cemented off. It should also be noted that the contaminant concentrations from MW-93 were collected after the borehole was left open for about a week. This allowed the groundwater to freely migrate within the borehole, which produces anomalous results even when performing discrete interval sampling.

Fifth bullet. The increase in ammonia at MW-75 further illustrates the lack of capture that has been occurring with SEW-1 and SEW-2.

Section 2.5 **Hydraulic Capture Within the Saginaw Aquifer Plume**

The potentiometric map discussed (Figure 8) is still comprised of data from monitoring wells that are open boreholes in the bedrock and those with discretely located well screens at various depths in the aquifer. During the most recent phase of bedrock drilling (2000), it was determined that there is an overall downward hydraulic gradient in the Saginaw aquifer. This information indicates that the potentiometric map cannot be accurate. Monitoring wells screened deeper in the aquifer will subsequently provide lower water level elevations, open borehole wells will provide homogenized elevations, while those screened shallower will provide higher water level elevations. This is evident in Figure 8 around MW-65, which is screened deeper than the other discretely screened monitoring wells. Just south of MW-65 are monitoring wells MW-55 and MW-56, which are screened at the top of the Saginaw aquifer and consequently provide higher water level elevations. A more accurate presentation of the water level data would be to have separate maps from monitoring wells screened at similar depths and a map of those wells with open boreholes, such as the BWL production wells.

These two extraction wells appear to have an effect on groundwater flow in their vicinity. However, it is not possible to determine how large the drawdown cone might be or how effective the capture actually is since there are no point of compliance wells to confirm these conditions. See comments above regarding MW-75. SEW-2 still cycles on and off depending on the water levels in the treatment plant. Its average rate for January was 23 gpm. The values given in the text for these wells are the uptime pumping rates, which is misleading. An extraction well that is not run continuously at an optimum rate cannot provide adequate hydraulic or chemical capture. In addition, even the groundwater model does not support hydraulic capture at such low pumping rates.

Page 12, Section 3.0 Plume Remediation—Mass Removal
First paragraph. MW-60 is noted as the only monitoring well in Zone 3 with a vinyl chloride detection. The text does not indicate that this well has never had vinyl chloride in it before.

Second paragraph. Now that vinyl chloride has reached SEW-1 (3 µg/l) and it is apparent that chemical breakthrough is occurring because of the ammonia increase in MW-75, significant efforts must be taken to prevent further breakthrough at these two extraction wells.

Page 14, Section 5.1 First Quarter 2001 Groundwater Sampling
First paragraph. Of the 22 designated BWL wells routinely sampled, according to Table 6, two have never been sampled as part of this process: 25-14 and 25-18. BWL wells 25-20 and 25-26 are noted in Table 6 as "not accessible." These BWL wells should be sampled during the next scheduled event. There has been ample time to get these first two wells ready for sampling no matter what has precluded this in the past (~3 years so far).

Page 15, second full paragraph. As has already been pointed out, the sampling protocol being followed is not allowing representative aquifer samples to be collected.

Page 17, BWL Wells Northwest of MWDS Plume
BWL well 25-22 actually does demonstrate an increasing trend of ammonia over the last three quarters according to Figure 7. It appears that, with an ammonia concentration of 0.6 mg/l, BWL 25-29 should be put into the bimonthly sampling schedule.

BWL Wells South of MWDS Plume
Several of these BWL wells have increased in the past three sampling events according to Figure 7 contrary to the text. BWL wells 45-02, 25-13, and the noted 30-06 all have increasing trends. BWL wells 45-01 and 45-02 both have ammonia concentrations that put these wells into the bimonthly sampling schedule, yet they are still shown as quarterly in Table 6.

Page 16, top paragraph. As just noted above, several BWL wells have shown increasing trends in the past 3 to 4 sampling events. These trends can be seen in Figure 17 as well.

Tables
Table 1. The groundwater elevation noted for MW-39 is not the equilibrated value. The number on the contour maps is also wrong. Changing the value on the contour maps will require these maps to be redrawn. A number of monitoring wells are now designated in this table with an "R" behind their label, i.e., MW-5R, MW-31R, MW-43R, etc. The key or the text does not indicate what this "R" means; this should be clarified. The water level elevations for some of the monitoring wells in Table 1 do not match with those on Figures 3 or 3A, e.g., MW-5 and MW-37. The values in the table are about 4 feet higher for each of these wells.

Figures
Figure 3A. The 816.25- and 816.50-foot contour lines near the Zone 1 extraction wells should not be located between the two extraction wells. They should be located north of each extraction well. The drawdown cones are unlabeled, too large, and too elongated for the data supplied, especially considering the relatively high values of hydraulic conductivity observed in this area. These drawdown cones are drawn almost perpendicular to the natural groundwater gradient (north-northeast to south-southwest); whereas, they should be oriented parallel to it and to the plumes. PZ-4 is included in the drawdown cone of Z1-P2, but no water level data were collected from this piezometer. There is no justification for expanding the cone so far to the south-southeast, particularly when it appears that there was only ~1.25 feet of drawdown between Z1-P2 and MW-82, less than 10 feet away.

The water levels from the extraction wells should not receive as much emphasis as they appear to due to inherent well losses. The extreme difference in water levels between Z1-P1 and MW-77 indicate that this extraction well should be rehabilitated: about 10 feet for only 25 gpm.

Contour lines should not cross the open water of the MSV pond. The water level at MW-4 appears unusually low, especially so close to the pond even if it is not draining well.

The flow lines and contours do not appear to translate well to chemical capture based on the results of MW-37 and MW-31.

Figure 3B. The contouring of the water table surface in Zone 2 is also unusual. Contour lines 814.0 and 814.25 wrap around the north side of Z2-P1; however, the water level at MW-76 is 814.47. The contouring should be redone. The flow lines are based on this contouring, and based on the chemical breakthrough observed, do not appear to be useful indicators of capture. The drawdown cones are larger than the data can support, which also makes the contouring

more difficult. The groundwater surface actually appears to slope down from MW-76 toward MW-71 further east by 0.2 foot, just opposite of what one should expect. The piezometers were not part of the water level stabilization work. Therefore, one must assume that these water levels are not useful for this potentiometric map.

Monitoring points with anomalous data are MW-39 and MW-84. MW-39 has a lower water level elevation than does MW-76 that is within 10 feet of the extraction well, the drawdown cone of which appears to be quite limited in areal extent. The value for MW-39 on the figure should also be lower. The water level in MW-71 should not be lower than that in MW-76. One would expect MW-84 to have a higher water level than it does. This latter monitoring well has provided unusual water level readings since it was installed. The reason behind these unusual readings should be determined and the problem corrected.

The vinyl chloride concentration in MW-71 along with the water level data again illustrate the lack of capture out to this monitoring well.

The water levels in Z2-P2 have been similar to Z2-P1 in the past. The data from this quarter indicate that both the extraction well and nearby monitoring well, MW-80, are significantly lower than in the past. The extraction well is about 2 feet lower, and MW-80 is about 1 foot lower. These data may indicate a need for rehabilitation of these two wells.

Figure 3C. The one piezometer installed in this zone, PZ-6, is too far to the east to provide useful data regarding the hydraulics downgradient of the extraction wells. There is no way to demonstrate chemical capture in this zone (no bypass) due to lack of useful monitoring wells; the demonstration of hydraulic capture has always been a problem for this reason.

Figure 7. More of these contour lines should be dashed due to the scarcity of data to the north, east, and west of the heart of the currently defined bedrock ammonia plume.

Figure 8. As mentioned earlier, this potentiometric map is flawed. It uses data from monitoring wells with open boreholes and discretely placed well screens. A predominantly downward hydraulic gradient significantly impacts any portrayal of these data on one figure. Wells with deeper screens will have lower hydraulic heads, shallow screens will have higher heads, and open boreholes will have homogenized heads.

Without some point of compliance or other type of monitoring wells nearby, it is impossible to determine the dimensions of the drawdown cones or how effective these two extraction wells are in capturing groundwater. These cones are drawn much larger than they should be because these extraction wells are not run continuously, particularly SEW-2.

REFERENCES

Puls, R. W. and Barcelona, M. J., 1996. "Low-Flow (minimal drawdown) ground-water sampling procedures." Ground Water Issue, United States Environmental Protection Agency, EPA/540/S-95/504 April 1996.

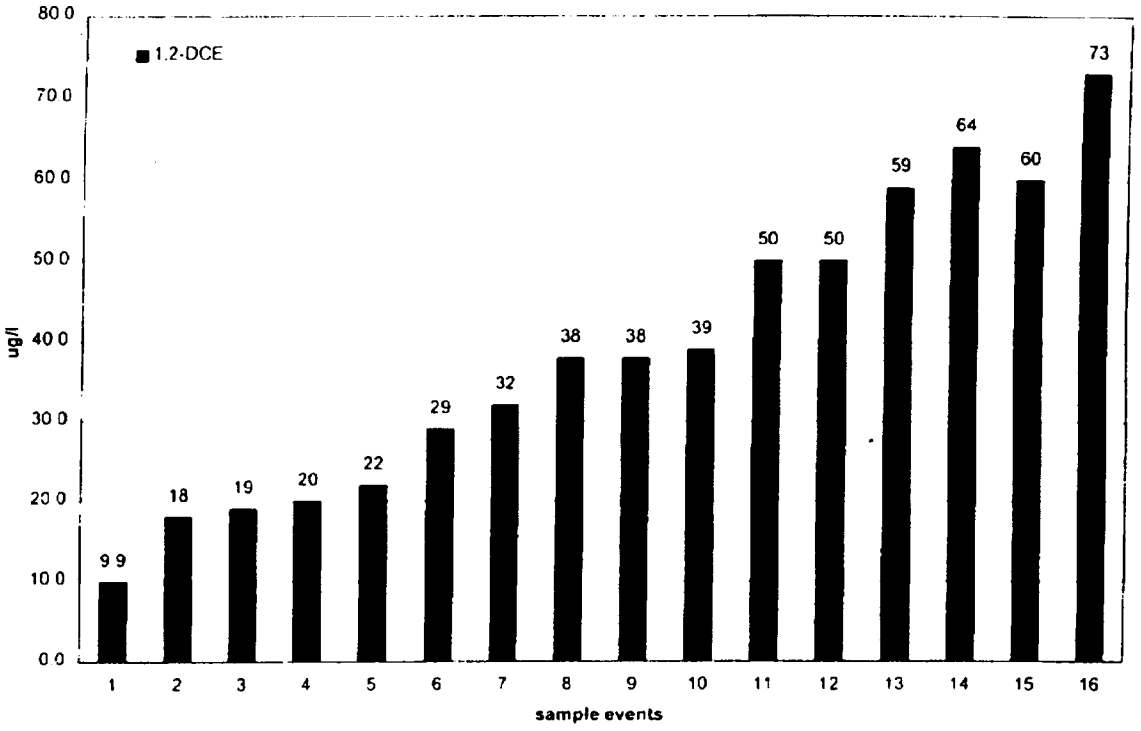
Attachments

cc: Jim Heinzman, Superfund Section, ERD

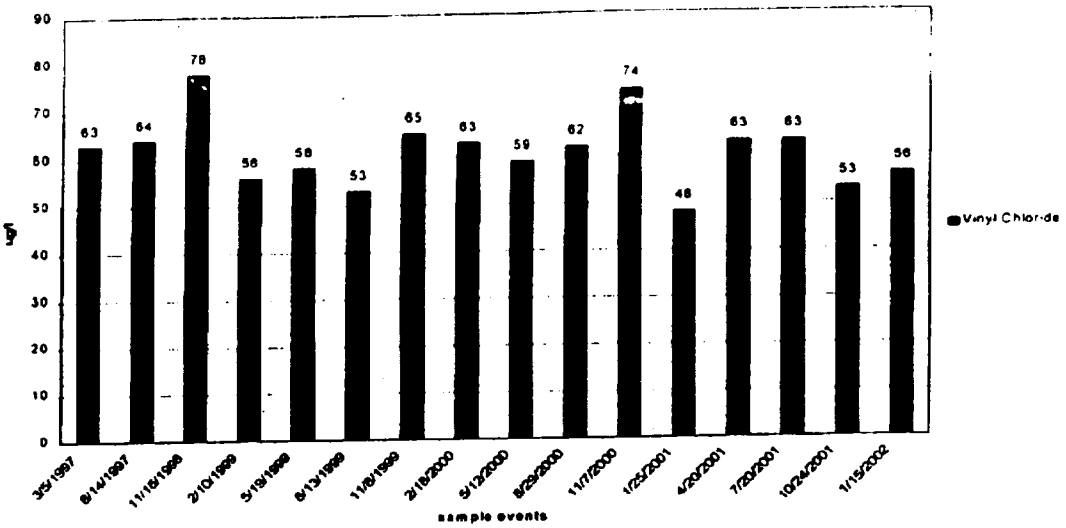
MWLOrr#17 501 doc

Monitoring Well Data Charts

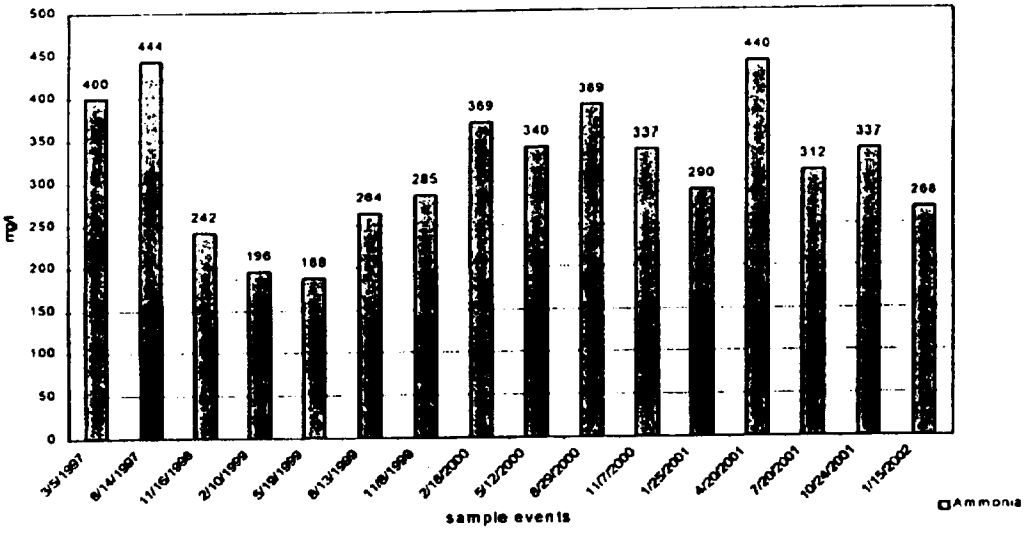
1,2-DCE in MW-37

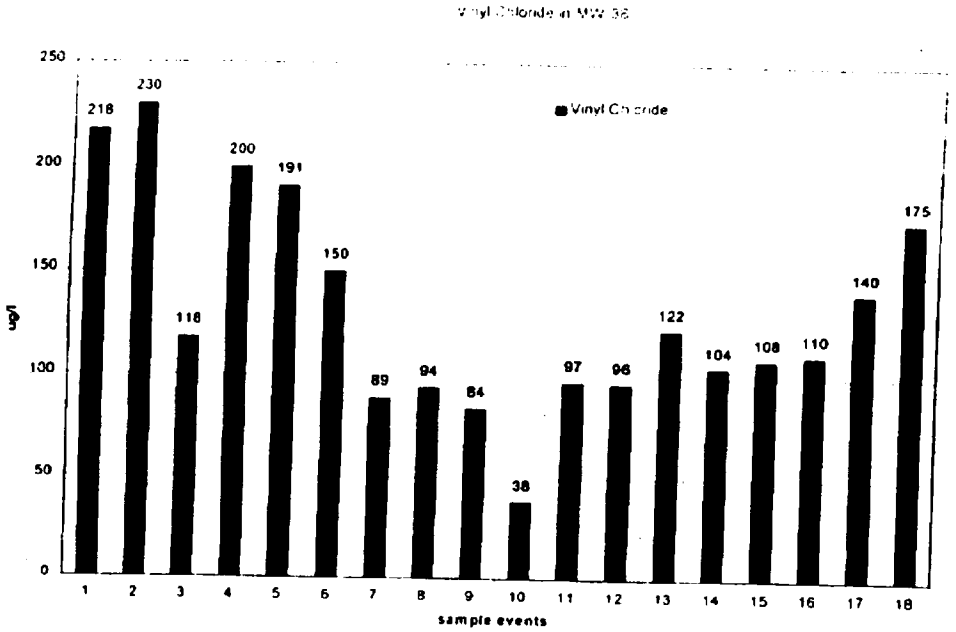


Vinyl Chloride in MW-31

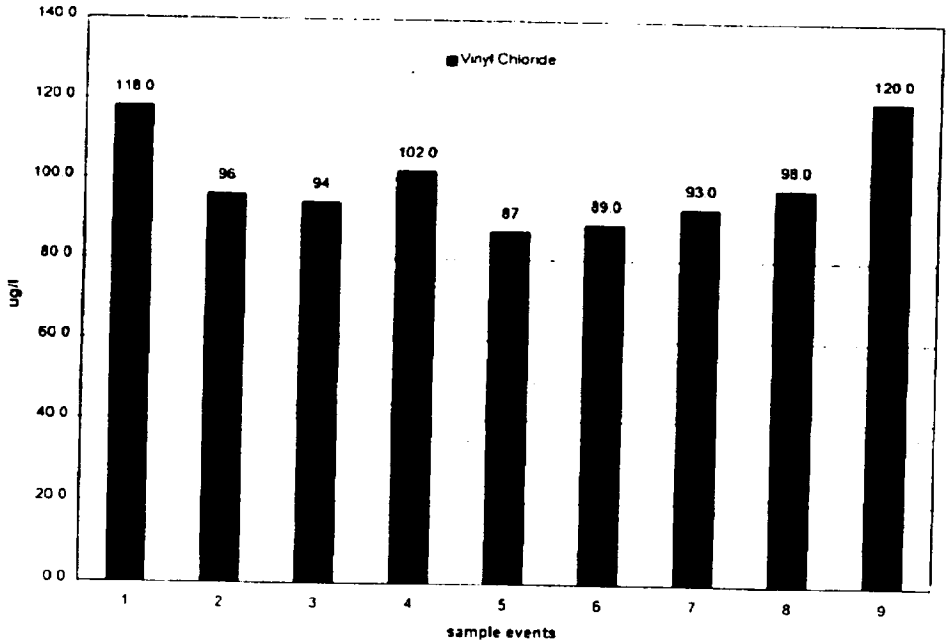


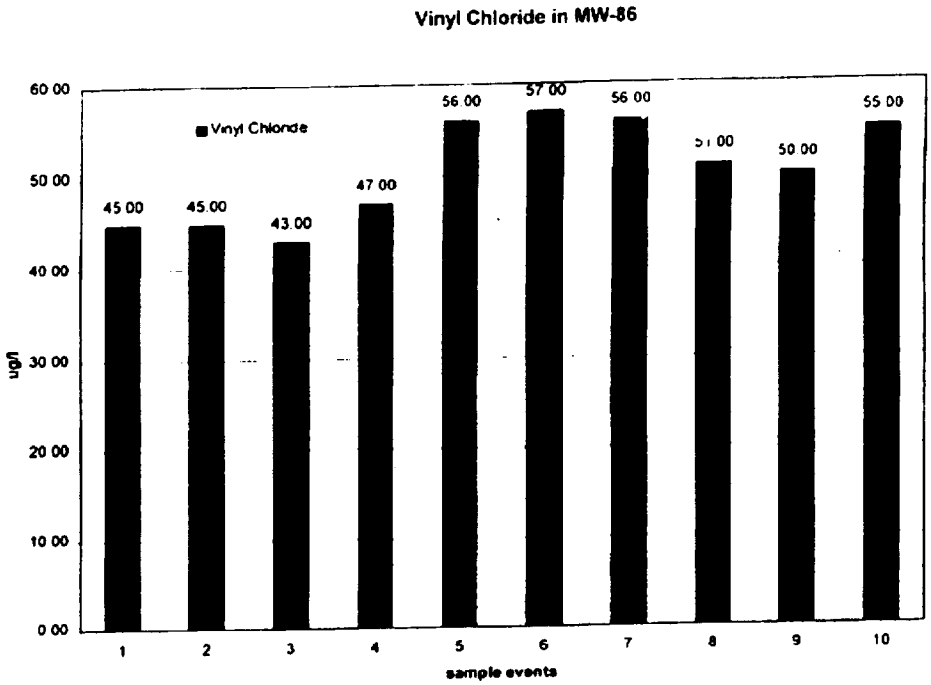
Ammonia in MW-31





Vinyl Chloride in MW-85




Vinyl Chloride in MW-86
Vinyl Chloride
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30 00
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10 00
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45.00
43.00
47 00
56.00
57 00
56 00
51 00
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55 00
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sample events

JOHN ENGLER
GOVERNOR

DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

RUSSELL J. HARDING
DIRECTOR

May 16, 2002

Mr. John O'Grady
Remedial Project Manager
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604

Dear Mr. O'Grady:

The purpose of this letter is to document several concerns that the Michigan Department of Environmental Quality (MDEQ) has related to the Motor Wheel Disposal site (MWDS) located in Lansing, Michigan. We would appreciate the opportunity to discuss and resolve these issues with the United States Environmental Protection Agency (U.S. EPA), so that we can move forward in a positive fashion with this important site.

Status of the Amended Statement of Work

We have several concerns with the Amended Statement of Work (A-SOW) as well as the events surrounding the negotiation of this document. As background information, the MDEQ was a full participant in negotiating technical statements of work for the MWDS, including the original Remedial Design/Remedial Action SOW, the Interim SOW, the Long-Term SOW and in the extended negotiations for the Combined SOW (C-SOW). The C-SOW was to incorporate technical requirements associated with the Superfund action as well as work needed to address concerns of the U.S. EPA Safe Drinking Water Branch. Discussions regarding the C-SOW went on for well over one year, until the concept was abandoned after the third circuit vacated the Safe Drinking Water Branch's Section 1431 Order. At some point thereafter, the U.S. EPA and Goodyear entered into negotiations for the A-SOW.

The MDEQ made several attempts to be involved in the technical discussions regarding the A-SOW, but for reasons unclear to us, the U.S. EPA did not allow us to participate. We were told that there would be no new concepts or major technical changes; that the A-SOW would simply combine the pertinent portions of the I-SOW and C-SOW into a single document. In December 2001, we were told by the U.S. EPA Remedial Project Manager (RPM) that the negotiations were concluded and that the A-SOW had been finalized. The MDEQ requested a copy of the document and an opportunity to review and provide comments. We were told by the RPM that we could have a copy of the document, but because it was in final form, there would be no opportunity for changes to be made, based upon MDEQ comments. Shortly thereafter the RPM left Superfund and work on the project became somewhat delayed until now.

The MDEQ has recently learned from the March monthly progress report submitted by Sharp and Associates that, contrary to what we were told by the U.S. EPA, the A-SOW and amended Consent Decree have not yet been formally adopted by the U.S. EPA and Goodyear.

Therefore, the MDEQ has prepared comments on the A-SOW and have included them as an attachment to this letter. We would appreciate the opportunity to discuss our comments with the agency.

Groundwater Model

Over the past couple of years Goodyear has worked with MDEQ, the U.S. Geological Survey (USGS) and consultants to the Lansing Board of Water and Light (BWL) to develop an acceptable groundwater fate and transport model for the MWDS. The MDEQ, USGS and BWL have spent many hours and thousands of dollars working with Goodyear's consultants. However when USGS and MDEQ submitted lengthy comments on the model, the U.S. EPA chose to hold onto those comments and not submit them to Goodyear. Both the MDEQ and the USGS deemed the model to be of very limited usefulness, yet the U.S. EPA agreed to allow Goodyear to use it as they see fit. We believe that the comments generated by the MDEQ, USGS and BWL should be submitted to Goodyear for discussion on improving the quality of the groundwater model.

Monitoring Well Completion Methodology

Approximately one year ago Goodyear drilled several monitoring wells deep into the Saginaw aquifer, in an attempt to better define the extent of the contaminant plume in the Saginaw aquifer. During work plan development, the agencies could not reach agreement with Goodyear on the methodology to be used to complete the wells. It was agreed that discussions would be held during the drilling program to design an appropriate methodology for completing the wells. Above our strong objection, the U.S. EPA agreed to allow Goodyear to place FLUTe liners in two wells and dual packers in six wells. According to the U.S. EPA, there would be a six month evaluation period, after which additional FLUTe systems may be required.

For numerous reasons the MDEQ and USGS disagreed with the use of dual packers as a final well completion method. The MDEQ believes that there are several acceptable methods available to complete the eight wells, yet Goodyear has apparently never evaluated anything other than the dual packers and FLUTe liners. A six month evaluation period, which has not yet started because neither the packers nor the FLUTEs have been installed by Goodyear, is entirely unnecessary. The wells should be completed immediately, and in a manner that will actually allow for the gathering of meaningful data. Dual packers will not provide this data. Compounding the problem, the eight boreholes have been left open for over a year now, allowing water to mix and homogenize, possibly rendering questionable data from future groundwater samples.

This issue is one that is very important to the MDEQ. An adequate groundwater monitoring system is central to protecting the BWL north well field. The proposed monitoring system will not provide adequate data. We wish to resolve this issue such that the agencies require Goodyear to complete the wells appropriately. However, should this issue not be resolved in a manner acceptable to the MDEQ, we are prepared to spend state dollars to install an adequate monitoring well network and seek to recover our costs from the liable parties at a later date.

Lack of Progress on Saginaw Aquifer Cleanup

Almost one year ago Goodyear committed to the installation of two additional extraction wells in the Saginaw aquifer. These extraction wells were to be designated as SEW-3 and SEW-4. The purpose of SEW-3 was to prevent further migration of the contaminant plume to BWL wells to the northwest of the MWDS plume. This well was to be placed on-line no later than April, 2002. SEW-4 was to be installed in early spring 2002 and be placed in the core of the plume to remove the more highly contaminated groundwater. SEW-4 was to begin pumping in October, 2002. The MDEQ supported Goodyear's proposal. SEW-3 was installed in late fall/winter 2001-2002, but has not yet been made operational. Goodyear's plan is to discharge water from the Saginaw extraction wells to a storm sewer that was recently installed by the Ingham County Drain Commission. Litigation exists between the drain commissioner and certain parties unhappy with the assessment levied upon them for the new sewer lines.

Goodyear has chosen to refrain from discharging to the storm sewer until the litigation is resolved. The problem with this scenario is that no end to the litigation is in sight. This lawsuit could literally drag on for years. Goodyear needs to be pumping SEW-3 right now. Fortunately, a reasonable resolution to this problem exists. For the past three years Goodyear has, during the summer months, discharged purge water from all of the extraction wells to the City of Lansing sanitary sewer. The U.S. EPA should require Goodyear to begin pumping SEW-3 immediately. Goodyear can discharge to the sanitary sewer if they choose not to utilize the storm sewer until the litigation is resolved.

Additional Saginaw Aquifer Characterization

The placement of SEW-3 and SEW-4 was not meant to be the final action in the Saginaw aquifer. In prior meetings Goodyear committed to additional characterization of the Saginaw aquifer, particularly to the south, in order to assess potential plume migration in that direction. In fact, a BWL well (25-7) to the south has exhibited vinyl chloride and elevated ammonia, which may be attributable to the MWDS. Goodyear needs to submit a work plan for additional hydrogeological characterization and resolve to what extent the plume is migrating in a southerly direction.

Glacial Aquifer

As we have documented on numerous occasions, the glacial aquifer extraction system is not performing adequately. There is demonstrable lack of capture in both zones one and two, and capture in zone three is marginal at best. In fact, in the quarterly monitoring report for the first quarter of 2002, Goodyear agrees that there is a lack of capture in zones one and two. This lack of capture, particularly in zone two is allowing glacial aquifer contamination to continue to migrate into the Saginaw aquifer, as evidenced by increasing vinyl chloride concentrations in the Saginaw aquifer.

Goodyear representatives have stated that once the Saginaw extraction wells are discharging to the storm sewer, there will be capacity in the treatment plant to allow for increased pumping in the glacial aquifer. That however, is of little comfort when there is yet no sign of Goodyear beginning to pump the new Saginaw wells. This is yet one more reason for the U.S. EPA to require immediate pumping of SEW-3 and SEW-4.

We look forward to discussing these issues with you and working toward their resolution.

Sincerely,

Robert L. Franks
Superfund Section
Environmental Response Division
517-335-3392

Enclosure

cc: Mr. Nicholas Burwell, BWL
Ms. Charlene Denys, U.S. EPA
Mr. James Mayka, U.S. EPA
Mr. Donald Bruce, U.S. EPA
Ms. Claudia Kerbawy, MDEQ
Mr. Tim Benton, MDEQ
Mr. David Kline, MDEQ
Mr. Charles Graff, MDEQ

MDEQ COMMENTS ON THE MOTOR WHEEL DISPOSAL SITE AMENDED STATEMENT OF WORK

May 15, 2002

The following comments are not meant to be a complete set of detailed comments on the document. Because of timing, we limited our comments to major issues only.

1. It is unclear why there is a "carve out" of Lansing Board of Water and Light (BWL) wells 25-13, 25-14, 25-15, 25-16, 25-18, 25-19 and 25-26. These are the BWL wells that are closest to the plume. By declaring that the 1.2 mg/L "performance criteria" does not apply to these production wells simply allows for the continued migration of the plume, which may eventually impact other BWL wells that are currently being utilized.

2. Section 2.0 of the A-SOW states that the "performance criteria", which is 1.2 mg/L ammonia, is now the cleanup goal for the Saginaw aquifer. As such, Goodyear needs to provide hydraulic capture of the plume to at least 1.2 mg/L ammonia.

3. Section 2.1.1 states that containment of the Saginaw aquifer is required. It further states that containment shall be achieved by means of hydraulic capture of the plume to established CERCLA cleanup standards. The established CERCLA cleanup standard for ammonia is 34 mg/L. Section 2.0 states that the cleanup goal for ammonia is now 1.2 mg/L. Numerous places within the A-SOW state that BWL wells must be protected from ammonia impacts greater than 1.2 mg/L. Our question then is how does hydraulic capture to 34 mg/L ammonia protect the BWL wells and achieve compliance with the cleanup goal of 1.2 mg/L?

4. The A-SOW does nothing to address the existing contamination of BWL well 25-25. Saginaw Extraction Wells (SEW) 1-4 will not remediate that portion of the aquifer at 25-25.

5. The first sentence in section 2.1.3 is illogical. Containment to 34 mg/L ammonia will not protect the BWL wells to 1.2 mg/L ammonia.

6. Language in the A-SOW states in several locations that SEWs 1-4 will provide capture of the plume, although it is unclear if this is referring to the 1.2 mg/L ammonia plume, or the 34 mg/L ammonia plume. In any event, these statements are untrue. At best, SEWs 1-4 will provide capture of that portion of the plume migrating to the northwest, to 34 mg/L ammonia. They will not address that portion of the plume that is migrating to the south. It is also very unlikely that they will achieve capture of the northwest migrating plume that exists at lower concentrations, between 1.2 mg/L ammonia and 34 mg/L ammonia.

7. The schedule attached to the A-SOW is extremely vague.

We look forward to discussing and resolving these comments with you.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

June 18, 2001

TO: Rob Franks, Project Manager
Site Management Unit 2
Superfund Section
Environmental Response Division

FROM: Charles Graff, Project Geologist
Geological Support Unit
Superfund Section
Environmental Response Division

SUBJECT: Review of the "First Quarter 2001 Monitoring Report for the Motor Wheel Disposal Site in Lansing, Michigan," dated April 30, 2001, Ingham County, Michigan

I have reviewed the "First Quarter 2001 Monitoring Report" submitted by Sharp and Associates, Inc. (Sharp) for the Motor Wheel Disposal Site (MWDS) that I received on May 1, 2001.

Fifty-eight monitoring and extraction wells installed in the glacial and bedrock aquifers were sampled for groundwater chemistry and water level measurements, including the Board of Water and Light (BWL) production wells. My comments follow:

SUMMARY OF QUARTER 13 COMMENTS

The potentiometric map for the bedrock aquifer uses data from wells that are screened shallow, deep, and are open boreholes. Using data from wells screened at various depths within the Saginaw aquifer does not produce an accurate map, particularly when a downward hydraulic head was observed during the hydraulic packer testing within the newly drilled boreholes. These conditions must be acknowledged and maps need to be contoured correctly in all future submittals. Selecting only the points that are appropriate to contour will allow for the production of maps that accurately represent the potentiometric surface in a given area, especially in areas of the aquifer that are under pumping stress.

There is a continuing problem in these monitoring reports regarding the ability to demonstrate hydraulic and chemical capture with this treatment system. In Zone 1, capture is inadequate. In Zone 2, too few data points were usable for demonstrating hydraulic capture, and available data support a lack of hydraulic and chemical capture. Potentiometric contouring was not possible. In Zone 3, the same situation existed: not enough data points were sampled for contouring. In addition, not enough data points are present to demonstrate hydraulic and chemical capture. There are not sufficient monitoring points near the extraction wells in the bedrock aquifer for an adequate demonstration of hydraulic or chemical capture. One bedrock well was recently

installed, but more are necessary, especially if the bedrock plume is allowed to expand toward these extraction wells. An expansion of this type may be a violation of Rule 705 (5) of Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended.

The main weight of evidence for capture in these reports is the groundwater contouring—the contour and flow lines. Unfortunately, the contouring is often unusual and subjective with highly contorted contour lines that do not represent a natural water table surface altered by pumping wells. The cross sections added to the individual pumping zone potentiometric maps should also replicate a natural water table surface, but they do not. The potentiometric surface is drawn as a straight line between successive data points along the cross section: essentially a "connect the dots" depiction. These two illustrations should complement each other and they do not.

Lack of hydraulic and chemical capture in the glacial aquifer will allow more contamination to migrate into the bedrock aquifer and further south along the glacial plumes. This deficiency will prolong the time, increase the risk to the municipal water supply, and increase the money required to remediate the glacial and bedrock plumes.

Stating that since MW-71 is now below the cleanup level of 2 µg/l indicates that it is now within the capture zone is not appropriate; not enough data are presented to support this position. In fact, other data indicate just the opposite. The groundwater gradient between MW-71 and the closest extraction well in Zone 2 is away from the extraction well, not towards it.

A monitoring well near the BWL's fly ash pit is used to support a hydraulic influence to the Zone 1 extraction wells. This monitoring well, BL-MW-1-S, is the shallow well of a well cluster near an artificial pond north of the fly ash pit. The consultants for the BWL do not use this well for data collection due to its abnormal geochemistry and water level readings. This well has been used to create a significant bend to the west in the groundwater contours, which appears to be artificial. Other monitoring wells near the actual infiltration area near Bancroft Park would be more suitable for demonstrating the hydraulic influence from the Groesbeck Drainage Area.

Some monitoring wells are still being sampled with disposable bailers. We have asked on numerous occasions for explanations to this protocol as it is described in the text "...several of the shallower wells...with low purge volumes continue to be sampled using new, disposable bailers." No response has been given and site conditions do not justify the use of bailers. Vinyl chloride is highly volatile. There are more appropriate methods to collect groundwater samples containing vinyl chloride and the other volatile site compounds. The glacial aquifer is sufficiently transmissive that a low-flow sample pump could be used to collect these samples. This method would also eliminate sampling variability inherent with the bailer technique.

As noted later in this document, bedrock monitoring well MW-65 is being used as evidence that the vinyl chloride plume is present north of this well. It had also been used in the past to support the ammonia plume boundary north of this location. This well has produced anomalous groundwater chemistry since it was completed. All evidence supports a problem with the well completion. This location should be returned to a viable monitoring point.

A change in the sampling protocol of BWL well 25-25 has been suggested. See the comments regarding this change at the end of this document. To summarize, (a) the change does not appear warranted, (b) there is an ammonia problem at 25-25 that is well documented, (c) current protocol has been approved and appears to provide good quality data, (d) it is not clear how the data will be used; and (e) sampling changes may only complicate future decisions regarding ammonia exceedences at this well. The rationale provided for this sampling change is not justified, particularly with respect to the sample variability.

ACTION ITEMS

These are issues that require correction to bring the remedy into compliance and to improve the quality of the monitoring reports.

- Need to attain hydraulic capture in Zones 1 and 2 through increased pumping of existing extraction wells or more likely through the installation of additional extraction wells.
- Need more monitoring wells to determine chemical and hydraulic capture in Zone 3.
- Need some monitoring wells near the present bedrock extraction wells to determine their effectiveness in attaining hydraulic and chemical capture. One well was just placed between these two wells, but more are needed to ascertain these capture issues.
- Anomalous water level measurements still persist in the monitoring well network that should be rectified.
- Discontinue sampling with bailers to improve the data quality and sample representativeness.
- Finalize bedrock plume delineation in order to determine effectiveness of extraction wells to actually capture the plume.

SPECIFIC COMMENTS

Page 3, Section 1.1, January 2001, first bullet. It would be helpful for the reader to know what the problem was with the piping in the Zone 2 vault, what may have caused it, and how it was remedied. Simply stating that the piping was repaired does not indicate why the piping needed to be repaired. This comment applies to these monthly activities in general.

Page 4, Section 1.3, March 2001, last bullet. The text does not indicate how much increased flow was requested from the Surface Water Quality Division of the Michigan Department of Environmental Quality (MDEQ). It would also be helpful for the reader to know what the increased flow rate is based on.

First full paragraph. The text states: "This evaluation includes a discussion of...plumes, ...and the maintenance of hydraulic capture of the contaminant plumes in both the Glacial and Saginaw A[a]quifers." This statement is problematic due to the lack of supporting evidence used to demonstrate hydraulic capture. This has been an ongoing problem with these quarterly reports. Capture is either not occurring as depicted, or there are not sufficient data to support the capture as illustrated. Capture must first be attained before it can be maintained. The contour lines drawn around the extraction wells on the potentiometric maps are not realistic and tend to overestimate hydraulic influence. Specific details regarding the hydraulic capture analyses will be pointed out as the report deals with this issue.

Third bullet. Same comments as just mentioned regarding hydraulic capture: capture must first be attained before it can be maintained.

Page 5, top paragraph. The text mentions that "...several of the shallower wells...with low purge volumes continue to be sampled using new, disposable bailers." The text does not indicate what "low purge volumes" actually means. If the aquifer can deliver an adequate water supply, and there is no indication that it cannot, then it would be prudent to use more appropriate means to collect the groundwater samples instead of using a bailer. Non-dedicated low-flow pumps similar in design to those already in use at the site as dedicated pumps could be used in these monitoring wells. The bladders and tubing are all disposable, so the decontamination issue would be minimal and the results would be more representative of aquifer conditions. Using non-dedicated sampling pumps significantly reduces the sample variability that is inherent with bailers. Using a sample pump would also allow sample collection after aquifer parameters have stabilized producing samples representative of aquifer conditions. Purging an arbitrary well volume may or may not produce accurate results: it would not be quantifiable. Bailers should only be used in monitoring wells that cannot produce adequate groundwater to satisfy the low-flow sampling protocol. This demonstration has not been made and it is doubtful whether it can be made considering the ability of the glacial aquifer to produce sufficient groundwater based on the available hydraulic conductivity data.

The text then goes on to discuss the two open borehole bedrock monitoring wells, MW-75 and MW-78, and "...that [they] require higher purge volumes..." On what information was this determination made? No supporting evidence is offered, nor is the said protocol found in Appendix F, Comprehensive Groundwater Monitoring and Sampling Plan of the Final Design Report. These wells should not be completed as open borehole wells. Collecting the data in this manner provides homogenized hydraulic head and chemical data, which are not comparable to other site data and make it difficult to assess site risks.

Section 2.1, **Chemical Evaluation of the Glacial Contaminant Plumes**
Vinyl Chloride
Third bullet. The text indicates that "The 100 µg/l isoconcentration contour line was reinterpreted to include the area behind [upgradient] of MW-32...," but the text does not indicate why the contour line was changed. The reader must review the figure to understand that the concentration of vinyl chloride in the monitoring well increased to greater than 100 µg/l (110 µg/l). These are the highest concentrations of vinyl chloride recorded in this well as part of an increasing trend (see chart at end of document). Several other wells south of Zone 1 also have increasing trends of vinyl chloride, which does not support chemical capture of this plume.

Fourth bullet. This discussion focuses on the vinyl chloride concentrations detected in MW-71, historical and current, and states that because flow rates were increased in the nearby extraction well, MW-71 is now below the cleanup value. The flow rate in the nearby extraction well, Z2-P1, was increased to 60 gallons per minute (gpm) in January 1999. There was no change in concentration below the cleanup level of 2 µg/l until this quarter, i.e., this is the first quarter in over 13 quarters of sampling that this monitoring well has had a vinyl chloride concentration less than the cleanup value of 2 µg/l. Note that it was decided during a meeting in

early December 1999, between the United States Environmental Protection Agency (U.S. EPA), Goodyear, Sharp, and the MDEQ, that further concentrations above the cleanup value would necessitate increased pumping (above 60 gpm) or installation of additional extraction well(s) between MW-71 and the existing extraction well in attempts to demonstrate hydraulic and chemical capture. None of these actions were taken, even though conditions clearly warranted them. Furthermore, the distance between MW-76 and the point of compliance well MW-71 is about 450 feet and the hydraulic head difference is only 0.1 foot between these wells this quarter with MW-76 having a *higher* water level than in MW-71—the opposite of what it should be. There is certainly no available data to support a drawdown cone from Z2-P1 out to MW-71. It is significant to note that MW-76 is less than 10 feet east of the extraction well and has similar water levels as wells much farther away, suggesting the extraction well exerts little influence in the aquifer. Again, there are no data presented in this report that demonstrate hydraulic or chemical capture out to MW-71. If vinyl chloride increases to 2 µg/l or greater, what then are we to assume?

Fifth bullet. The data appear to be somewhat manipulated to suit the goals of the cleanup. In the third Quarter of 2000, the duplicate for MW-38 was 122 µg/l of vinyl chloride, versus 104 µg/l. However, this information is not shown on any of the figures and was not mentioned in the text.

Ammonia

Second bullet. The chemical data from monitoring wells MW-12D and MW-36 are not necessarily optimum for establishing a plume separation of ammonia between the Zone 1 and Zone 2 extraction wells. MW-12D is west of Z1-P2, and MW-36 is somewhat east in being downgradient of Z1-P1. MW-31 is still almost 300 mg/l and is directly downgradient and between the two Zone 1 extraction wells. The narrowest point between the currently illustrated (Figure 2) ammonia plume(s) is an area that includes MW-31 and the piezometer PZ-4. This piezometer is closer to the extraction wells than MW-31 and the illustration of the northern extent of the southern ammonia plume (34 mg/l) line lies just downgradient (south) of it. This piezometer should be sampled to support the assumption of plume separation. If PZ-4 were clean, below 34 mg/l ammonia, this would lend support for the separation of the ammonia contamination into two plumes. It is important to gather all available data to support this position. Otherwise, this is just conjecture. The ammonia plume may be simply necked down and not separated at all.

Page 7, third bullet. This bullet discusses the ammonia concentrations at MW-31 and their decrease. It is interesting to note that there has never been a discussion concerning the increases of ammonia seen in this monitoring well. If the extraction wells have indeed separated the ammonia plume into two segments, this well should not have had dramatic increases in ammonia concentrations that it has exhibited in the past, and it should have much less ammonia in it than it currently does since it is directly downgradient and between the Zone 1 extraction wells. One would expect clean water to be flushing through the aquifer beyond the "capture zone" of Zone 1 if it is truly effective, thus reducing contaminant concentrations dramatically. See the ammonia chart at the end of this document.

Sixth bullet. The monitoring well referred to in the text is MW-41R, not MW-41.

Section 2.2 Hydraulic Capture in the Glacial Aquifer Plume

Page 8, first paragraph. The agreement reached was that the data from the Trolls would be evaluated after one year's time, and then a decision would be made regarding their future use. It may prove useful to continue to collect data from these transducers for a longer period of time than just one year.

First bullet. From discussions with BWL personnel, it is my understanding that there never was open water within the BWL North Lansing Landfill (NLL), or fly ash pit. It had been dry for years after its use as a gravel pit, which is why they began to landfill the fly ash in it. It is not clear why this statement is being included in this report. It appears erroneous in nature, and if it is, this information should be removed from this and future reports.

The data from BL-MW-1-S should not be used for potentiometric surface estimations. The consultants, who monitor the wells in and adjacent to the NLL Natural Resources Technologies, Inc. do not use this well since it provides unusually high water level elevations and uncharacteristic groundwater geochemistry. This monitoring well is part of a well cluster and has the shallowest screen of the group. BL-MW-1-S is also adjacent to an artificial pond that is used for holding cement truck wash water, explaining some of the anomalous data it produces. I understand there are other monitoring wells in this cluster with well screens at similar elevations as the MWDS wells that may provide better quality data. A more suitably screened well should be used for water level measurements from this area. There has not been any explanation for the use of this well for several quarters' worth of comments. In addition, considering the infiltration area is mostly along the northern edge of Bancroft Park, it is unclear why a well farther north and west of a number of monitoring wells adjacent to this area is being used to support a claim of infiltration.

Third bullet. It is doubtful that the glacial MWDS extraction wells have played much of a role in the observed low water levels. Five years of drought conditions is the more likely cause.

Zone 1

Page 9, first bullet. Figures 3 and 3A exhibit very unusual groundwater contour lines, particularly the 815.75-foot contour line near the Zone 1 extraction wells. The resulting groundwater flow lines simply amplify the inaccuracies of the contour lines, i.e., if the contour lines are inaccurate, the flow lines will be as well. Both sets of lines do not seem to follow typical norms established for generating potentiometric maps. The contour lines are supposed to simulate the natural contour of the water table surface, but it is highly unlikely that the water table surface is as contorted as these figures indicate. These unusual depictions of the potentiometric surface for Zone 1 are biased in favor of hydraulic capture. Recontouring of the data for Zone 1 displayed a less contorted water table surface and subsequently less hydraulic capture (see attached figure). There appears to be some containment from the two extraction wells, but it does not appear to be sufficient to prevent breakthrough or achieve complete hydraulic capture. An example of chemical breakthrough is the ammonia concentrations observed in MW-31: they are not significantly different than what they have been in the past. Vinyl chloride results are similar. See the charts at the end of this document.

This bullet also claims that based on the flow lines, groundwater flow is completely controlled in the area between MW-73 and Z1-P2. However, no water level data were collected at MW-73 so this statement cannot correctly be made without supporting data to establish how far to the west the capture of Z1-P2 actually exists. It should be pointed out that no monitoring points exist between Z1-P2 and MW-73, a distance of over 300 feet, except MW-82, which is within 10 feet of the extraction well. MW-73 is the designated point of compliance well to the west where capture is supposed to reach and be measurable. This is not the case, nor has it been for some time now.

MW-37 has had steadily increasing concentrations of cis-1, 2-Dichloroethene (cis-DCE) since system startup in 1997: this quarter reaching 64 µg/l. The Record of Decision (ROD) Cleanup Criteria for this contaminant is 70 µg/l. There has never been a discussion regarding this increase in cis-DCE nor how the persistence and increase of this contaminant relate to the alleged hydraulic capture on the eastern side of Zone 1. In fact, there is no discussion of hydraulic capture being measured on the eastern side of this zone at all; there is only discussion of the vinyl chloride plume boundary. The next bullet discusses hydraulic capture to the east, but no specifics are given, only that the "eastern capture of Zone 1...[is]...aided by groundwater mounding...to the east..." It appears that hydraulic capture to the east can be assumed; but based on the chemistry of MW-37, this does not appear to be the case.

Second bullet. As just noted above, the hydraulic capture east in Zone 1 is assumed, not specified with supporting data as to how far the capture zone extends. This bullet discusses the "infiltration benefit" coming from the east from the Groesbeck Drainage District. Unfortunately, all of this "benefit" is based on the water level data from one monitoring well, BL-MW-1-S. As noted earlier, the chemical and hydraulic data from this well are highly suspect, but an enormous amount of importance is placed on these data. The wells that are actually closest to the drainage area near Bancroft Park should receive the attention pertaining to hydraulic influence on the MWDS extraction system, not BL-MW-1-S that is the northernmost monitoring well near the BWL fly ash pit away from Bancroft Park.

Page 10, first bullet. This bullet discusses the steep gradient on the northern side of the MSV gravel pit and how recharge from the open pit influences groundwater flow across the MWDS as illustrated by the 818.25-foot contour line. If the water level elevation in the gravel pit is indeed 816.27 feet as Figure 3A indicates, then every contour line currently illustrated south of the pit except 816.25 feet and below should be relocated north of the gravel pit. This correction will produce a very different depiction of the potentiometric surface in Zone 1 and will support an even steeper hydraulic gradient north of the gravel pit (seven additional contour lines north of the gravel pit pond). The area between the pit and the extraction wells will be very flat. These changes would indicate the pit is receiving groundwater from the surrounding aquifer except to the southwest where it would be discharging groundwater. The other option is that the water level in the gravel pit pond is not accurate with regard to the surrounding monitoring well elevations. These observations strongly suggest there is a problem with either Figures 3 and 3A or the potentiometric surface elevation measurement of the gravel pit pond. Either way, this area needs to be re-contoured.

Second bullet. This bullet attempts to support a "stagnation zone" near PZ-4. The discussion is based entirely on the contouring from the potentiometric maps, which appears to be erroneous. Objective illustrations and data must be used to support a determination of a stagnation zone at this piezometer. A cross section from north to south along the piezometers did not illustrate measurable influence from the two extraction wells south of Zone 1.

Zone 2

First bullet. This bullet states "Flow lines indicate that capture of both...plumes continues north of the pumping wells, where full capture width is developed." This supposition rests entirely on the contouring and subsequently drawn flow lines as seen in Figures 3 and 3B. However, hydraulic head data was not collected from four monitoring points in this pumping zone: PZ-1 through PZ-3, and MW-80 adjacent to Z2-P2. Contour lines are drawn around these data points as if there were data on which to base the line's position. The lines near these data points are appropriately dashed, but the subsequent flow lines are not. These flow lines are what the strength of this discussion rests upon. As noted in the Zone 1 contouring, if the contour lines are inaccurate, so will be the flow lines. In addition to these problems, the capture of the plumes is supposed to occur **at** the pumping wells, **not** north of them some arbitrary distance that is not mentioned. The Zone 2 extraction wells are designed to "...cut off the plume before entry to the lower (Saginaw) aquifer...," from the Final Design Report. Further, "The point of compliance wells will be utilized during the ongoing remediation program to delineate the effective capture zone of the extraction wells...," from Appendix J of the Final Design Report. MW-71 and MW-81 are the designated point of compliance wells in Zone 2. It is obvious that from the start of this project the hydraulic capture in each pumping zone was designed to be effective in stopping further spread of contamination beyond the extraction wells of that particular pumping zone and was supposed to be demonstrable in the point of compliance wells. The cone of capture is supposed to reach out to these point of compliance wells. However, this does not appear to be the case this quarter—or in past events—based on water level or contaminant data observed. The contamination that bypasses the Zone 2 extraction wells is free to migrate into the Saginaw aquifer below, contrary to the required design of this system. Allowing this contamination to continue to bypass the pumping zone will prolong the cleanup of the bedrock and glacial (Zone 3) aquifers.

Four of the monitoring points in this zone were not sampled, and 3 had anomalous water level measurements. MW-84 appears to be too low, and MW-71 and MW-39 are also unusual. It is not possible to contour this area for lack of data points and unusual readings.

Second bullet. The increased pumping rates beyond the design rate of 45 gpm at each extraction well still does not appear sufficient in developing an effective capture zone in Zone 2 as the data clearly illustrate. The monitoring wells south of Zone 2 illustrate chemical breakthrough from the two extraction wells. This should not happen if they are performing as designed.

Zone 3

First paragraph. The text states that at a combined rate of about 58 gpm "The potentiometric map and established zones of capture for this zone show an increased zone of capture during the period...when compared to the Fourth Quarter 2000 report." It is not possible to determine

how this conclusion can be reached based on the hydraulic head data available. Only three of the monitoring wells in the entire zone had water level measurements taken from them: MW-63 (600+ feet east), MW-70 (250+ feet west), and MW-64 (south of Z3-P2)--the only monitoring well near an extraction well. It is important to note that the extraction wells were out of service for maintenance during the Fourth Quarter 2000 sampling event as noted on Figure 3C of that report, and the value for MW-74 on the cross section was over one-foot too low. Essentially no capture was evident during the Fourth Quarter 2000 sampling event. Perhaps this is how capture appears to be increased from the last quarter. To reiterate, it is not possible to state that any amount of hydraulic capture was achieved in Zone 3.

First bullet. The last sentence in this paragraph is not in agreement with conventional hydrogeological concepts. This sentence attempts to explain that the upper portion of the aquifer flows to the southwest or west while the lower portion flows to the south. Groundwater flow does not change directions at differing elevations in an aquifer without hydraulic boundaries separating these different zones. No such boundaries have been detected in the aquifer in the respective discussion area: PZ-7 and the Zone 3 monitoring wells. This sentence should be removed or the theory should be revised.

It is highly likely that the water level readings from PZ-7 are not accurate with respect to actual aquifer conditions. During drilling, the glacial till was encountered at a shallower depth than the next closest monitoring wells, about 40 feet higher. The boring was advanced an additional 40 feet into this till. The subsequent slug test on the completed piezometer took about a minute to recover as opposed to seconds as seen in the other piezometers, indicating a serious problem with its connection to the aquifer. The cuttings from the till were brought to the surface along the flights of the hollow stem augers. It is quite likely that the lower permeability materials of the till were smeared along the borehole to the surface during this drilling process. The subsequent well development was substandard since it was performed with a groundwater-sampling pump. It was not aggressive enough to remove much material from the area adjacent to the slotted PVC screen.

Page 11, Section 2.3 **Vinyl Chloride and Ammonia Concentrations in Glacial Aquifer Extraction Wells**
First paragraph. The text notes that the vinyl chloride concentrations peaked in April of 1998. However, Figure 4 graphically illustrates these data and May is denoted as the month of peak vinyl chloride concentrations. The text and figure should correlate.

Section 2.4 **Chemical Evaluation of the Saginaw Aquifer Plumes**
Vinyl Chloride
Figure 7 and not Figure 6 has the recently installed Saginaw aquifer monitoring wells located on it.

First bullet. There are some problems with this discussion regarding the location of the southern boundary of the vinyl chloride plume based on the chemistry in MW-66 and MW-65. Although MW-66 has been used as a monitoring well for a few years now, its screen location was not necessarily chosen based upon the highest chemical concentrations. This well was installed as a piezometer as a last ditch effort to save the boring: it was not installed as a monitoring well.

MW-66 was not drilled or sampled to the same depth as surrounding bedrock monitoring wells. Consequently, there are much less chemical data from this well, nothing below approximately 200 feet below ground level (bgl). Surrounding bedrock wells were drilled to approximately 340 feet bgl. The formation encountered in MW-66 was also less permeable than encountered in the other bedrock monitoring wells; some zones actually dried up during sampling.

The absence of vinyl chloride in MW-65 is also used to support the vinyl chloride plume boundary as being located north of this monitoring well. The groundwater sample used to locate the well screen in the boring had the highest concentrations detected within the borehole during vertical aquifer sampling: 173 mg/l ammonia, 4 µg/l vinyl chloride, and 82.4 mg/l potassium. Subsequent sample concentrations dropped off dramatically after well completion, whereas samples from MW-67 and MW-68 have not dropped off in a similar fashion. Monitoring wells do not "clean up" to such low concentrations naturally in such a short span of time (less than one year). MW-65 had ammonia concentrations above 34 mg/l near the top of the Saginaw aquifer to the total drilling depth. There definitely appears to be a problem with the completion of this monitoring well in allowing the collection of representative aquifer samples. Steps should be taken to provide a viable monitoring point in this area once again.

Page 12, second bullet. The potentiometric map discussed (Figure 8) is still comprised of data from monitoring wells that are open boreholes in the bedrock and those with discretely located well screens at various depths in the aquifer. During this most recent phase of bedrock drilling, it was determined that there is an overall downward hydraulic gradient in the Saginaw aquifer. This information indicates that the potentiometric map cannot be accurate. Monitoring wells screened deeper in the aquifer will subsequently provide lower water level elevations, open borehole wells will provide homogenized elevations, while those screened shallower will provide higher water level elevations. This is evident in Figure 8 around MW-65, which is screened deeper than the other discretely screened monitoring wells. Just south of MW-65 are monitoring wells MW-55 and MW-56, which are screened at the top of the Saginaw aquifer and consequently provide higher water level elevations. A more accurate presentation of the water level data would be of separate maps from monitoring wells screened at similar depths and a map of those wells with open boreholes, such as the BWL production wells.

Fourth bullet. The highest concentration of ammonia from MW-55 was 31.2 mg/l not 30.7 mg/l.

Section 2.5 **Hydraulic Capture Within the Saginaw Aquifer Plume**
First paragraph. The data for Figure 8 are from January 2001, not November 2000.

The text states that Figure 8 "...continues to display a well-developed zone of capture surrounding the two extraction wells." There are little data on which to base this statement or to draw the contour lines. These two extraction wells do appear to have an effect on groundwater flow in their vicinity. However, it is not possible to determine how large the drawdown cone might be or how effective the capture actually is, since there are no point of compliance wells to confirm these conditions. The statement in the text is overstating the available data. In addition, recall that SEW-2 still cycles on and off depending on the water levels in the treatment plant: its rate was 22 gpm during the sampling event. An extraction well that is not run continuously at an optimum rate cannot provide adequate hydraulic or chemical capture.

Third paragraph. The last two sentences should be deleted from the text. They state that based on the plume boundaries, the pumping rates of the two extraction wells "...provide capture of the vinyl chloride...[and] ammonia..." plumes. These statements are speculative for the following reasons:

- the plumes are poorly defined, particularly their downgradient extents closer to the extraction wells,
- the hydraulic and chemical capture cannot be properly assessed—breakthrough is a distinct possibility,
- there are little data on which to base these statements, and
- the extraction well rates may not be optimal for complete capture (design rate of only 100 gpm), aside from the fact that SEW-2 cycles on and off, which further reduces its effectiveness.

Page 13, Section 3.0 **Plume Remediation—Mass Removal**
The following phrase in italics could be added to the end of the first sentence of this paragraph to strengthen it: "The primary objective of the groundwater pump and treat system is to remove contaminants from the groundwater... *and prevent its further migration through hydraulic and chemical capture.*"

Pages 14 and 15, Sections 4.4, 4.5, and 4.6. The first paragraph in each section discusses how many gallons of groundwater were treated and discharged to Outfall 001 during the month. The second paragraph actually states the operating days during the month. It would be helpful to also know how many days the treatment plant was in operation.

Section 4.7 **Air Stripper Removal Efficiency**
Second paragraph. The chemical noted is trans-1, 2-DCE, but Appendix A indicates that both trans and cis-1, 2-DCE are analytes. Perhaps **total** 1,2-DCE is the correct term to use since each isomer is analyzed for in the effluent stream.

Page 16, Section 5.1 **First Quarter 2001 Groundwater Sampling**
First paragraph. Of the 22 designated BWL wells routinely sampled, two have not been sampled as part of this process: 25-14 and 25-18. BWL well 25-28 was sampled in January for the first time as part of this monitoring program. These two BWL wells should be sampled during the next scheduled event. There has been ample time to get these wells ready for sampling no matter what has precluded this in the past (~2 years).

Based on the recent data (January 2001) BWL well 30-06 should also be changed to a bimonthly sampling frequency. The last results in January were 0.67, 0.68, and 0.74 mg/l ammonia, which puts it into bimonthly sampling (0.6 mg/l through 0.9 mg/l ammonia).

Page 17, **BWL Wells Northwest of MWDS Plume**
Second paragraph. The majority of this paragraph is spent promoting a change to the sampling procedure currently employed at BWL well 25-25. The justification for this change appears to be that this well "...has shown a wide range of concentrations..." in ammonia samples. Samples collected prior to April of 2000 were taken using a bailer: hardly applicable for sampling a deep,

large diameter, open bedrock well. These ammonia results were all less than 0.3 mg/l ammonia. The remaining samples were all collected using a sample pump set at a similar depth as the former production well pump. Aside from the sample taken in January 2001, all but one sample from well 25-25 was at or above 1.2 mg/l ammonia. The average of all of the samples collected with the sample pump is 1.3 mg/l. Discarding the bailer-collected samples, the remaining samples appear within the range of ammonia concentration results from other BWL wells, both with and without production well pumps. The conclusion is obvious, there is a problem with elevated ammonia concentrations at well 25-25 and the analytical variability is not unusual compared to other BWL wells. The groundwater parameters of the sample collected in January, with a value of 0.51 mg/l ammonia, do not seem to fit well with the samples collected before or after it as observed in Appendix A. These somewhat anomalous readings cast doubt on how representative the ammonia result might actually be. It would be helpful to see the field notes to determine how much water was purged and how many readings were taken before the sample was collected.

The other justification for changing the sampling method is that because of the current sampling technique at well 25-25 these ammonia "...concentrations may not represent the average concentrations of the entire well column." These ammonia results are not required to be representative of the entire well column. The sample procedure for well 25-25 is used at all of the designated BWL wells without intact production well pumps. All parties involved in this project approved this procedure, and it was subsequently incorporated into the I-SOW. Sampling these BWL wells with the production well pump is not ideal, but short of removing the pump, it is the most reasonable means of obtaining groundwater samples from these wells. Similarly, it is better to sample the BWL wells with a sample pump than with a bailer: past results confirm this conclusion.

Sharp indicates that Goodyear would like to sample well 25-25 with a high volume pump and then sample the slipstream. They feel this technique would be "...more representative of conditions that would be generated by a BWL pumping well." It seems that Goodyear is not comfortable with the results from well 25-25. However, as noted above, seven of the past nine sample events at well 25-25 had ammonia concentrations of 1.2 mg/l or higher: there *is* an ammonia problem at this well. Changing sampling techniques will do nothing to address the ammonia exceedences established in this well. In addition, nothing about these data indicates there is a problem with this sampling technique.

The last sentence of this paragraph makes the assumption that this proposal is already acceptable by stating "USEPA will be notified prior to the conducting the test." It seems the agencies should determine whether this new technique is appropriate or not first.

Section 5.3 **Daily Ammonia Influent Sampling**
First paragraph. The I-SOW verbiage indicates that the ammonia cannot fluctuate by more than 0.2 mg/l ammonia within a 24-hour period. It is not apparent how the "...incremental averages of ammonia-nitrogen concentrations, based on the three-day rolling average..." can satisfy this goal. This "incremental" verbiage was never a discussion during the I-SOW negotiations. This incremental averaging could actually mathematically reduce an exceedence of 0.2 mg/l or

greater in a 24 hour period to a miniscule number. This does not appear to be protective of the conditioning plant operations. A further explanation in the text would be appreciated.

Page 18, **Section 6.0 Plans for the Second Quarter 2001**
It would be prudent to redevelop MW-50 and MW-59 if they are repairable. Damage to existing wells often allows surface material to fall into the well, which can interfere with future groundwater quality sampling and water level measurements as has occurred in other wells at the site, e.g., MW-41R that had "dirt" in the screen.

Tables
Table 6. The footnote at the bottom of the table is not accurate. The frequency of sampling is for all designated BWL wells, not just active wells. This is supported in the second line of the footnote that discusses inactive well protocol and uses the same sampling frequency. It appears that a simple correction is all that may be needed.

Table 7. Four of the designated BWL wells do not have analytical data from March 2001: 25-10, 25-21, 25-22, and 30-06. It is not clear whether the data were collected and left out of the table or simply not collected: these wells should have been sampled in March.

Figures
The enlargement of the potentiometric map into three separate maps has been helpful. However, considering the problems with illustrating the potentiometric surface, as has been noted in these and past comments, it may be prudent to include an additional figure at an even smaller scale. A smaller scale would allow a better depiction of the water table in each pumping zone.

Figure 1. The data do not support the lateral spread of the vinyl chloride plume north of the Zone 1 extraction wells as illustrated. It appears appropriate to draw isoconcentration lines north of the pumping wells, but the plume should not "balloon out" as it does as if there were numerous wells with vinyl chloride detections to expand the plume boundaries.

Figure 2. There should be a 200 mg/l ammonia contour around MW-31, since it has a concentration of 290 mg/l ammonia.

Figure 3. The groundwater contours near the end of the glacial plumes continues to illustrate that the bulk of the contamination migrating to the south will pass by to the north of the Zone 3 extraction wells by migrating west-southwest. This observation is based on the contour lines that bend to the west mainly due to the data from PZ-7. The remainder of the issues of this potentiometric map will be discussed in the subsequent potentiometric map discussions: Figures 3A, 3B, and 3C.

Figure 3A. Most of the assumed hydraulic capture in Zone 1 is based on the 815.75-foot contour line and the large drawdown cones. This contour line is very unusual and unrealistic, and it begins too far to the north near MW-73 on the western side of Zone 1. Just north of MW-73, the 816.0-foot and 815.75-foot contour lines almost touch each other. There are no data from MW-73 this quarter. The drawdown cones are unlabelled, too large, and too

elongated, especially considering the relatively high values of hydraulic conductivity observed in this area. They are asymmetrical with respect to the natural groundwater gradient (north-northeast to south-southwest); whereas, they should be oriented perpendicular to it. This figure does not support hydraulic capture.

As noted earlier, if the water level elevation in the pond is truly 816.27 feet, then every contour line between the gravel pit pond and the 816.25-foot contour line should wrap around the north side of the pond. Our assumption has always been that the water levels in the pond were a surface expression of the glacial aquifer groundwater levels. Based on this assumption, either the contouring must be radically changed to fit the data, or the incorrect data should be determined and thrown out and the area recontoured without it.

The cross sectional portion of the figure does not reasonably portray a groundwater surface affected by pumping wells. The cross section is little more than straight lines drawn between data points. It is appropriately dashed in areas with little data. This cross section and the contoured water table above should similarly match each other, yet they look nothing like each other. MW-77 is again illustrated on the east versus the west side of Z1-P1 where it is actually located.

Figure 3B. The contouring of the water table surface in Zone 2 is also unusual. MW-81, the point of compliance well to the west of the pumping zone, has water table elevation of 814.24 feet. However, the 814.25-foot contour is drawn over 300 feet north of this monitoring well. An independent contouring of the existing data proved impossible due to key monitoring point locations that were either not sampled or that were anomalous (see attached figure). Of 12 potential monitoring data points in proximity to Zone 2, only 5 appear to have normal data. As was pointed out earlier, the groundwater surface actually appears to slope down from MW-76 toward MW-71 further east, just opposite of what one should expect. Then from MW-71 to MW-84 to the northeast the water table rises again, as it should, but not to the extent one would expect. Four monitoring points have no data due to problems with snow and ice: MW-80, PZ-1, PZ-2, and PZ-3. Monitoring points with anomalous data are MW-39, MW-71, and MW-84. MW-39 has a lower water level elevation than does MW-76 that is within 10 feet of the extraction well, the drawdown cone of which appears to be quite limited in areal extent. The water level in MW-71 should not be lower than that in MW-76. And one would expect MW-84 to have a higher water level than it does. This latter monitoring well has provided unusual water level readings since it was installed. The reason behind these unusual readings should be determined and the problem corrected. In summary, key monitoring data points were not collected during this period preventing any meaningful contouring of the remaining data, some of which are anomalous, further complicating the problem. Snow and ice should not preclude sampling of monitoring points; this system must be verifiable all year long.

The cross sectional portrayal of the water table below is similar to that from Figure 3A: straight lines between data points. Also MW-80 is not west of Z2-P2 yet is again shown this way. It is simply not possible to draw meaningful contour lines in this pumping zone or similarly to demonstrate hydraulic capture.

Figure 3C. Contouring in Zone 3 is simply impossible. Only three data points were collected, only one of which is in proximity to an extraction well. The other two data points were located east and west of the pumping zone: over 600 and 250 feet respectively. Hydraulic capture is unlikely and cannot be demonstrated, and the text should point this out instead of stating that hydraulic capture is better than in the previous quarter (November 2000). Without data, there is no possible way to demonstrate capture. The one piezometer installed in this zone, PZ-6, is too far to the east to provide useful data regarding the hydraulics downgradient of the extraction wells. There is no way to demonstrate chemical capture in this zone (no breakthrough), and the demonstration of hydraulic capture has always been a problem.

Figure 7. More of these contour lines should be dashed due to the scarcity of data to the north, east, and west of the heart of the currently defined bedrock ammonia plume. It is interesting to note that in other figures and in tables of this report, the data up to March 2001 is included, but not in this figure. Adding these data to this figure would change the position of the ammonia isoconcentration lines out farther than presently drawn.

Figure 8. As mentioned earlier, this potentiometric map is flawed. It uses data from monitoring wells with open boreholes and discretely placed well screens. A predominantly downward hydraulic gradient will significantly impact any portrayal of these data on one figure. Wells with deeper screens will have lower hydraulic heads, shallow screens will have higher heads, and open boreholes will have homogenized heads. The assumed drawdown cone around SEW-1 does not have tick marks inside it to illustrate it has a lower elevation. This extraction well has a lower water level than nearby bedrock wells, the closest of which is ~1,200 feet upgradient, so one may assume a drawdown cone exists. However, without some point of compliance or other type of monitoring wells nearby, it is impossible to determine the dimensions of the cone or how effective these two extraction wells are in capturing groundwater.

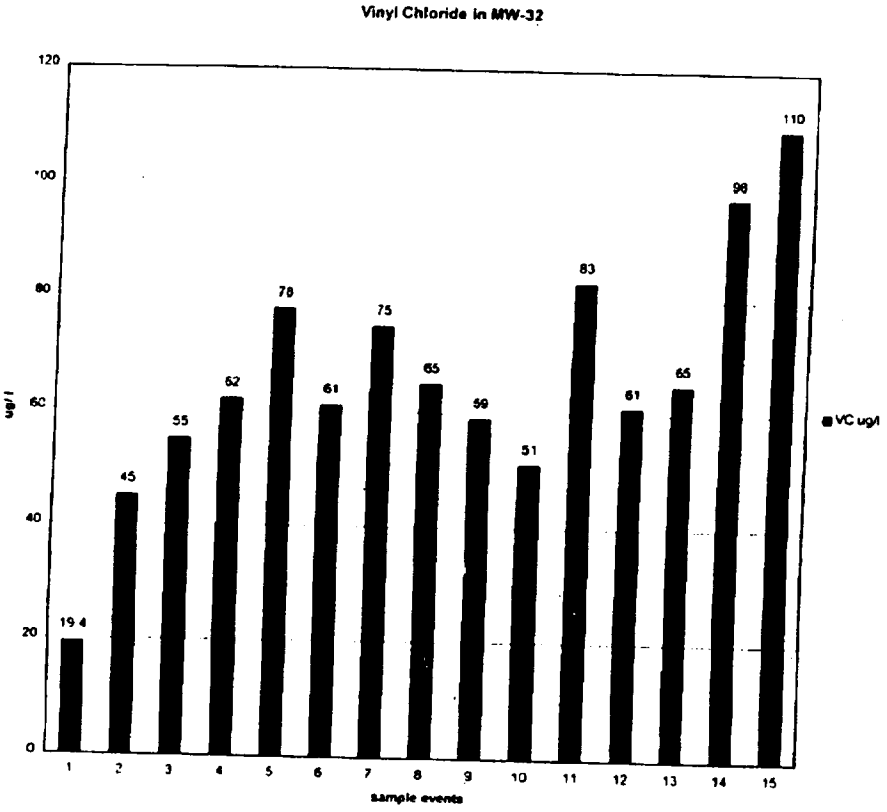
Figure 9. Four of the wells on this figure have never had detections of vinyl chloride in them, yet they are shown to have removed vinyl chloride over the past year, how ever miniscule it might be using the scale on this figure. If nothing has ever been measured in these wells, it is not clear why any concentration of pounds removed shou'd be illustrated in this figure.

Attachments

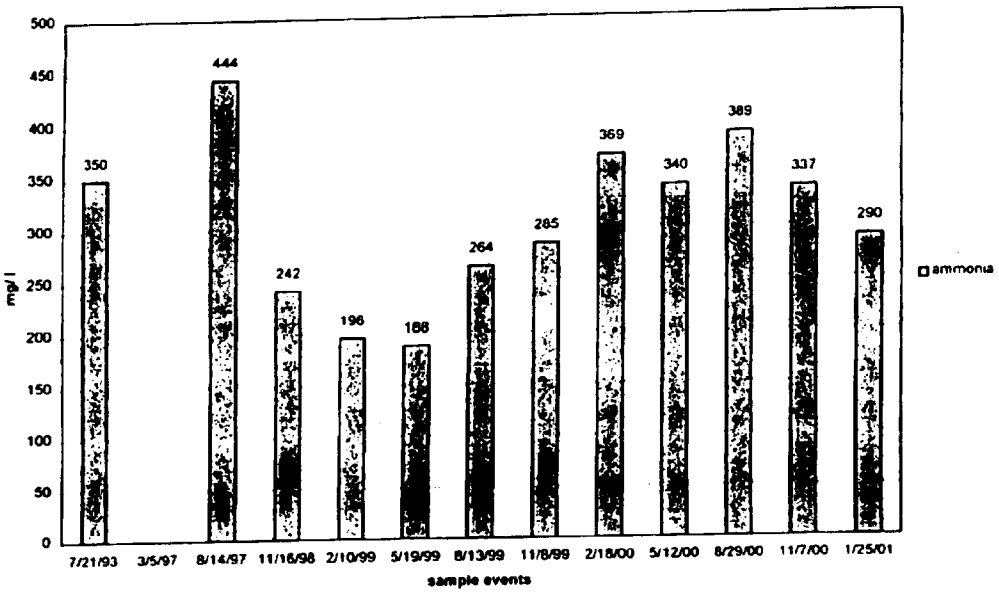
cc: Jim Heinzman, Superfund Section, ERD

S:_SITES\Motor Wheel Inc (Disposal Site) - S5\DOCS\GSU\Documents\MWI Qtr#13 501.doc

Monitoring Well Data Charts



Ammonia in MW-31



Vinyl Chloride in MW-31